HEWLETT® PACKARD

User's Guide

HP Low Speed Internet Advisor

User's Guide

HP Low Speed Internet Advisor

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Colorado Springs, Colorado 80919-2497

Safety Information

Before you use this instrument, be sure to pay special attention to the "Safety" and "Warning" sections in this Manual. Failure to comply with the precautions or with specific warnings in this book violates safety standards of design, manufacture, and intended use of this instrument. Hewlett-Packard Company assumes no liability for the customer's failure to comply with these requirements.

Electric Shock Hazard. Do not remove the system covers. To avoid electric shock, use only the supplied power cords and connect only to properly grounded (3-pin) wall outlets.

Explosion Hazard. Do not operate in the presence of flammable gases.

Fire Hazard. For continued protection against fire hazard replace only with fuse of same type and rating.

Hazardous Material. Should the LCD be damaged the liquid crystal material can leak. Avoid all contact with this material, especially swallowing. Use soap and water to thoroughly wash all skin and clothing contaminated with the liquid crystal material.

Cleaning. To clean the instrument, use a damp cloth moistened with a mild solution of soap and water. *Do not* use harsh chemicals. *Do not* let water get into the instrument.

Product Damage. Do not use this product when:

- the product shows visible damage,
- fails to perform,
- has been stored in unfavorable conditions,
- or has been subject to severe transport stresses.

Make the product inoperative and secure it against any unintended operation. Contact your nearest Hewlett-Packard Sales office for assistance.

Warning Symbols Used in This Book:

Instruction book symbol: the product will be marked with this symbol when it is necessary for the user to refer to the instruction book in order to protect against damage.

Indicates potential for electrical shock.

WARNING An operating procedure, practice, etc. which, if not correctly followed could result in personal injury or loss of life.

CAUTION An operating procedure, practice, etc., which, if not strictly observed, could result in damage to, or destruction of, equipment or software.

Conventions Used in this Book

NOTE An operating procedure, practice, or information of importance, separated form normal text.

Boxed Information

Explanatory comments or supplementary instructions are presented in boxed format.

Examples

Example programs or text is printed in the following format:

```
Block 1:
When DTE abc
   then goto Block 2
When DTE bc
   then goto Block 3
```

Throughout this manual, softkey labels are shown in parenthesis (softkey able) as they appear on the screen. Hard keys on the keyboard, including the function keys F1 through F12, are represented like **F1**.

In some cases, you must press two keys simultaneously. This is represented like **CTRL + Q**.

Operating Restrictions

The following warnings and operating information are shown in French followed by the English translation.

MISE ENGARDE

Cet appareil répond aux normes de la «Classe de sécurité I» et est muni d'un fil de mise à la terre pour votre protection.

MISE ENGARDE

Pour prévenir les risques de choc électrique, la broche de mise à la terre du cordon d'alimentation ne doit pas être désactivée.

WARNING

This product is a Safety Class I instrument with a protective earth terminal.

WARNING

For protection from electric shock hazard, power cord ground must not be defeated.

Restrictions d'utilisation
L'utilisateur se doit d'observer les mesures de précaution énumérées ci-dessous pour toutes les phases d'utilisation, de service et de réparation de cet appareil. Le fait de ne pas s'y conformer équivaut à ne pas respecter les mises en gardes spécifiques contenues dans ce manuel et constitue une violation des normes de sécurité relatives à la conception, la fabrication et l'utilisation prévue de cet appareil. La société Hewlett-Packard n'assume aucune responsabilité envers un client qui manquerait de se conformer à ces exigences.

Mise à la terre
Afin de minimiser les risques de choc électrique, le châssis et le cabinet de l'appareil doivent être mis à la terre. L'appareil est équipé d'un cordon d'alimentation muni d'une fiche homologuée à trois lames, compatible c.a. La prise murale et la prise femelle de la rallonge électrique doivent respecter les normes de sécurité de la «Commision électrotechnique internationale» (IEC).

Operating Restrictions
The following general safety precatuions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions with specific warnings in this manual violate safety standards of design, manufacture, and intended use of this instrument.

Grounding
To minimize shock hazard, the instrument chassis and cabinet must be connected to an electrical ground. The instrument is equipped with a three-conductor AC power cable compatible with an approved three-contact electrical outlet. The power jack and mating plug of the power cord must meet International Electrotechnical Commission (IEC) safety standards.

Environnement
Ne faites pas fonctionner cet appareil en présence de gaz inflammables ou de vapeurs dangereuses. L'utilisation de n'importe quel appareil électrique dans ces conditions constitue un risque élevé pour votre sécurité.

Service et ajustement
Des «tensions dangereuses» résident dans cet appareil. Par conséquent, le service et l'ajustement doivent être effectués uniquement par une personne qualifiée.

Ne remplacez pas de composantes lorsque le cordon d'alimentation est sous tension. Il pourrait y avoir présence de «tensions dangereuses» même lorsque l'appareil est déconnecté.

Ne faites pas de service interne ou d'ajustement sauf en présence d'une autre personne, capable de prodiguer les premiers soins et de pratiquer la réanimation.

Matiere dangereuse
Si l'affichage LCD est endommagé, la matière constituant les cristaux liquides peut se répandre. Eviter tout contact avec cette matière, et en particulier ne pas l'avaler. Utiliser de l'eau et du savon pour nettoyer soigneusement la peau et les vêtements qui auraient été contaminés par la matière constituant les cristaux liquides.

Service non autorisé
L'installation de pièces étrangères, ou toute modification apportée à l'appareil sans le consentement de Hewlett-Packard est formellement interdit. Le fait de procéder à de tels modifications sans autorisation pourrait entraîner l'annulation de la garantie de l'appareil ou de tout contrat de service.

Pour un service et des réparations autorisées, retournez l'appareil à un point de vente et service Hewlett-Packard.

Environment
Do not operate the instrument in the presence of flammable gases or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.

Service and Adjustment
Dangerous voltages exist within this instrument. Service and adjustment of this instrument is to be performed only by trained service personnel.

Do not replace components with the power cable connected. Dangerous voltages may be present even when the power cable is disconnected.

Do not perform internal servicing or adjustment unless another person, capable of rendering first aid and resuscitation is present.

Hazardous Material
Should the LCD be damaged the liquid crystal material can leak. Avoid all contact with this material, especially swallowing. Use soap and water to thoroughly wash all skin and clothing contaminated with the liquid crystal material.

Unauthorized Service
The installation of substitute parts or the installation of any instrument modification not authorized by Hewlett-Packard is specifically forbidden. The performance of such unauthorized service can negate the instrument warranty or any maintenance agreements.

Return the instrument to a Hewlett-Packard Sales and Service Office for authorized service and repair.

About this Manual. . .

This manual is the *User's Guide* for the HP Low Speed Internet Advisor.

- ***Chapter 1, Introduction*** explains what the Low Speed Internet Advisor is, the different ways it can be ordered, and it's features.
- ***Chapter 2, Startup and Installation*** tells you how to connect the Low Speed Internet Advisor to your network, and what you see when you turn it on.
- ***Chapter 3, The User Interface*** tells you how to use the operating system of the Low Speed Internet Advisor.
- ***Chapter 4, Testing with the Low Speed Internet Advisor*** tells you how to start using the Advisor. It has information on setup, monitoring, simulating, and storing data.
- ***Chapter 5, Evaluating Data*** explains how to analyze captured data. This chapter explains how to use the Examine Data menu to evaluate data.
- Chapter 6, Printing explains how to print your test results, menus, and measurements to a graphics or ASCII printer.
- ***Chapter 7, Remote/Slave Operation*** tells you how to configure the Low Speed Internet Advisor as a slave device and what remote options are available.
- ***Chapter 8, BERT Measurements*** explains how to make BERT measurements with the Advisor and how to interpret the results.
- ***Chapter 9, Capturing High Speed Data*** explains how to use the high speed capture application for monitoring and capturing data at speeds above 64 Kbps.
- ***Chapter 10, Terminal Emulators*** explains how to load and use Procom and the VT100 Terminal Emulators.
- ***Chapter 11, Programming Reference*** gives you information on programming commands, where they appear, and how to implement them. This chapter also contains examples with tips to expand your programming needs.

In addition to the regular chapters listed above, there are appendixes and a glossary of terms used in this manual.

Printing History

New editions are complete revisions of this book. Update packages may contain new or additional material and be released between editions. See the date of the current edition on the back cover of this book.

November 1995 First Edition ..... Manual Part No. 5964-0567

Additional Help

You can obtain additional assistance in the U.S. by:

Calling USA Help Line at (719) 531-4567
E-mail ntd_helpline@hp0800.desk.hp.com
FAX (719) 531-4506

or Internationally by calling your local HP Sales Office.

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1

Introduction

When you want to test data communications equipment, you need a system designed to meet the challenges you face. The Hewlett-Packard Low Speed Internet Advisor gives you all of the tools you need to test data communications links from 50 bps to 64 Kbps. In addition, you can use a provided high speed capture application for monitoring and capturing data at speeds above 64 Kbps.

The operating system of the Low Speed Internet Advisor is the *Toolkit*. This user interface simplifies operations, and lets you find problems on your network quickly. Using the Toolkit, you can configure the Advisor to run tests by pressing a "single key." Using the various Advisor features, you can:

- run tests with a single keystroke,
- store data in several formats,
- load data from previous tests,
- store and load special configuration menus,
- and import existing compatible DOS software.

You can set up filters and counters to "screen out" data you don't want to evaluate, or pinpoint events you want to search for. Logging of data provides a long-term history of link events.

Bit Error Rate Tests (BERT) give you the ability to look at transmission errors occurring on your network. The BERT display shows you different views of data transmissions to help you install, maintain, or troubleshoot your line.

Other Applications

Additional software applications are included with the Internet Advisor. You can access these applications from various areas in the Toolkit.

There is online manuals for most of these separate applications.

Low Speed Internet Advisor Features

Breakout Box

There is a breakout box and jumpering capabilities for the RS-232/V.24 connectors. The following figure shows the breakout box and associated connections. Note that the arrows point to the appropriate RS232/V.24 connectors on the side of the Advisor.

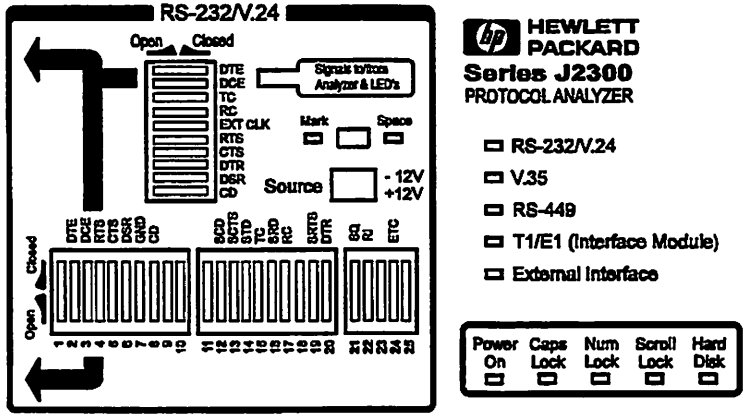

Figure 1-1: RS-232/V.24 Breakout Box

All 25 pins are available for jumpering on either side of the breakout switches. If your network cable has different pin assignments from a standard connector, use jumper wires to connect the lines to the desired pins.

Mark/Space Indicator. You can jumper any pin to the Mark/Space Indicator to determine the state or look at the LEDs on the panel.

Source Voltage. You can set any signal line on or off by jumpering to the available source voltage, either +12 volts or -12 volts.

Disconnect Switches. The signals going to and from the Advisor can be modified using the disconnect switches.

Source Voltage. You can set any signal line on or off by jumpering to the available source voltage, either +12 volts or -12 volts.

Disconnect Switches. The signals going to and from the Advisor can be modified using the disconnect switches.

Standard Connector Pinouts

The Internet Advisor comes with standard connectors for:

- RS-232C/V.24
- RS-449
- V.35

The pin assignments are listed in this section to assist you with your testing needs.

RS-232C/V.24

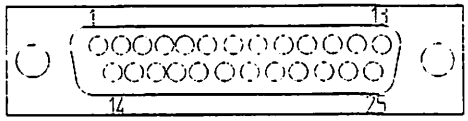

Figure 1-2: RS-232C Interface Connector Pins Assignment

Table 1-1: RS232 Interface Connector Pins

PIN	CCITT CIRCUIT	CIRCUIT FUNCTION	PIN	CCITT CIRCUIT	CIRCUIT FUNCTION
1	101	Protective Ground	14	118	Secondary Transmitted Data
2	103	Transmitted Data	15	114	Transmission Signal Element
3	104	Received Data			Timing (DCE Source)
4	105	Request to Send	16	119	Secondary Received Data
5	106	Clear to Send	17	115	Receiver Signal Element
6	107	Data Set Ready			Timing (DCE Source)
7	102	Signal Ground (common return)	18	Unassigned	
8	109	ReceivedLine Signal Detector	19	120	Secondary Request to Send
9	(Reserved for Data Set Testing)		20	108.2	Data Terminal Ready
10	(Reserved for Data Set Testing)		21	110	Signal Quality Detector
11	Unassigned		22	125	Ring Indicator
12	122	Secondary Received	23	111/112	Data Signal Rate Selector
		Line Signal Detector			(DTE Source)
13	121	Secondary Clear to Send	24	113	Transmit Signal Element
		Line Signal Detector			Timing (DTE Source)
			25	Unassigned	

RS-449

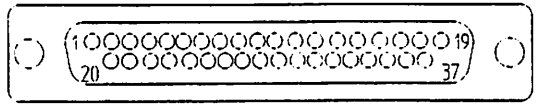

Figure 1-3: RS-449 Interface Connector Pins Assignment

Table 1-2: RS449 Interface Connector Pins

PIN	CIRCUIT NAME	PIN	CIRCUIT NAME
1	Shield	19	Signal Ground
2	Send Timing	20	Receive Common
3	Spare	21	Spare
4	Send Data	22	Send Data
5	Send Timing	23	Send Timing
6	Receive Data	24	Receive Data
7	Request to Send	25	Request to Send
8	Receive Timing	26	Receive Timing
9	Clear to Send	27	Clear to Send
10	Local Loopback	28	Terminal in Service
11	Data Mode	29	Data Mode
12	Terminal Ready	30	Terminal Ready
13	Receiver Ready	31	Receiver Ready
14	Remote Loopback	32	Select Standby
15	Incoming Call	33	Signal Quality
16	Select Frequency	34	New Signal
	/Signal Rate Selector	35	Terminal Timing
17	Terminal Timing	37	Standby Indicator
18	Test Mode	37	Send Common

V.35

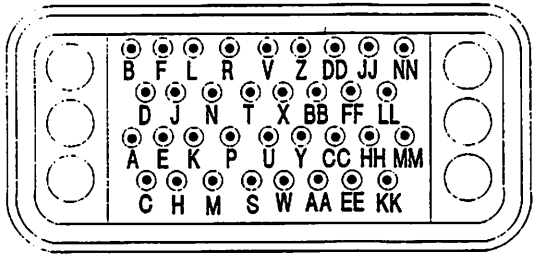

Figure 1-4: V.35 Interface Connector Pins Assignment

Table 1-3: V.35 Interface Connector Pins

PIN	CIRCUIT NAME
A	Chassis Ground
B	Signal Ground
C	Request to Send
D	Clear to Send
E	Data Set Ready
F	Receive Line Signal Detect
P	Transmit Data (A)
R	Received Data (A)
S	Transmit Data (B)
T	Received Data (B)
U	Terminal Timing (A)
V	Receive Timing (A)
W	Terminal Timing (B)
X	Receive Timing (A)
Y	Transmit Timing (A)
AA	Transmit Timing (B)

LEDs

There are three groups of LEDs showing various functions in the Advisor.

Lead Status LEDs

There are ten pairs of LEDs to indicate lead status for all of the internal V-series interfaces. They indicate data, clock and control information for both the equipment (Mark, off) and line (space, on) sides. The lead status LEDs are three-state indicators:

- Red - Equipment (Mark, off)
- Green - Line (Space, on)
- Both LEDs Off - high impedance

Interface Activity LEDs

There is a group of five LEDs that show you which interface is currently being used. These are:

- RS-232/V.24
- V.35
- RS-449
- E1/T1
- External Interface

2

Installation and Startup

To turn on the Low Speed Advisor, plug it in and turn it on. The on-off switch is located on the left side of the Advisor just above the power cord.

The first display, a Toolkit window, should look similar to the following figure:

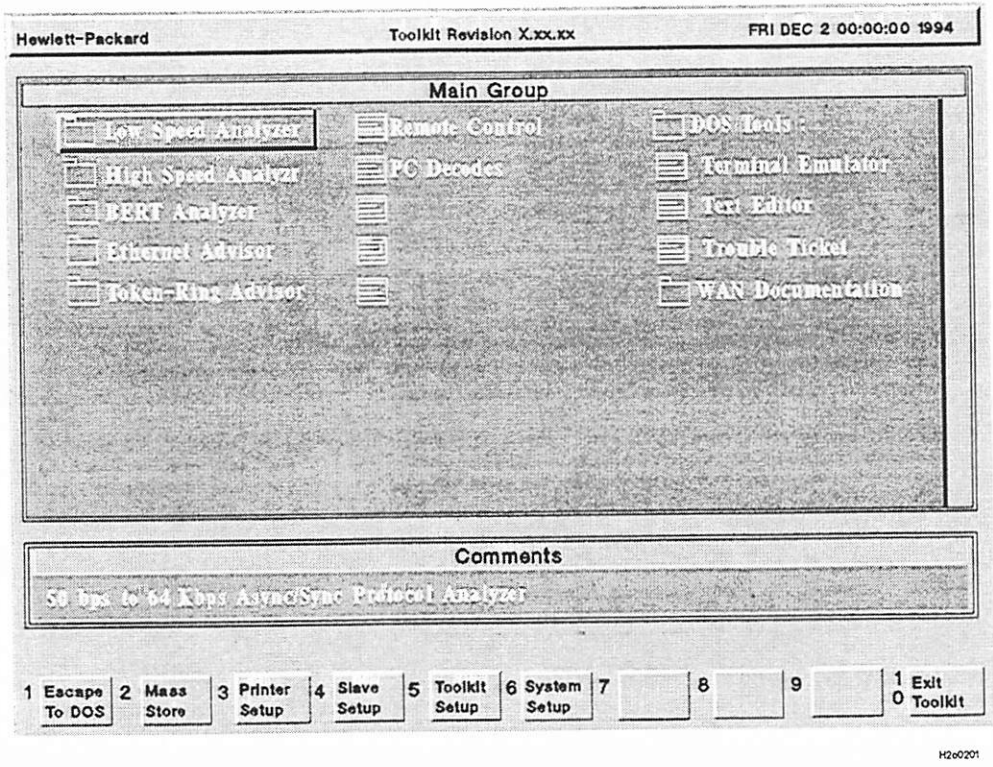

Figure 2-1: Top Level Display

For more information on using the Toolkit see *The Toolkit* in chapter 3.

NOTE

The HP J2300A Toolkit will not have High Speed, Ethernet, or Token-Ring selections.

Connecting the Advisor to Your Network

V-Series interfaces provide standardized interconnection of Data Terminal Equipment (DTE) and Data Circuit-terminating Equipment (DCE). DTEs are usually computers, PCs, printers and CRTs and DCEs are usually modems, DSUs, TAs, and NTs (ISDN Terminal Adapters and Network Terminators). DTEs are the sources or destinations of binary data. DCEs are the devices which facilitate long-haul connections between DTEs.

V-Series recommendations specify that DCE devices should have a female connector. This is almost always the case. DTE devices are specified to have a male connector, but many times they also use the more rugged female connector internally and depend upon a male to male cable to correctly carry the data and control signals to the DCE. You should keep this in mind while making connections described in this chapter, because the specified connectors might change gender due to the particular usage.

Figures 2-2 through 2-5 show Advisor connections to a V-Series interface. You can connect the Advisor at either the DCE or DTE end of the V-Series link. Since each of the data, control, and timing signals have their own conductor in a V-Series interface, the connection to the Advisor is always "straight through."

There are four main ways of connecting the Advisor to a circuit to be tested. Figures 2-2 and 2-3 show the connection of a V-Series interface to a circuit for monitoring.

You use a Y-cable (a cable with one female and two male connectors) to connect the Advisor for monitoring. After connecting for monitoring, the Advisor can collect and interpret data as well as compile statistics.

The Advisor passively monitors the circuit under test. To passively monitor is to monitor without transmitting data or exercising control over the interface.

Figure 2-2 shows the connection of the Advisor between a DTE and DCE. You make this connection by momentarily interrupting the circuit to install the female and male Y-cable connectors, as shown. This can cause an interruption in service. The other male connector goes to the appropriate test port of the Advisor.

Monitor Connections

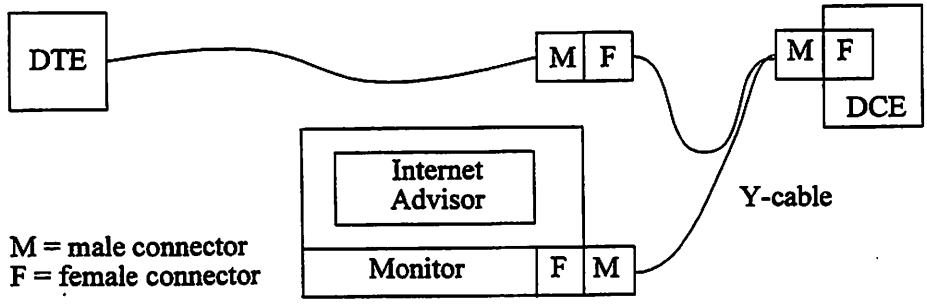

Figure 2-2: V-Series Passive Monitor In-Line Connection

Figure 2-3 shows a test panel as part of the test circuit system. The test panel can be accessed for monitoring without interrupting the service. One male connector, of the Y-cable, goes to the rear port on the Advisor, the other male connector goes to the monitor port on the test panel, and the female connector is not used. Either Advisor port could be used but care must be taken when using the front port because the switches might be opened.

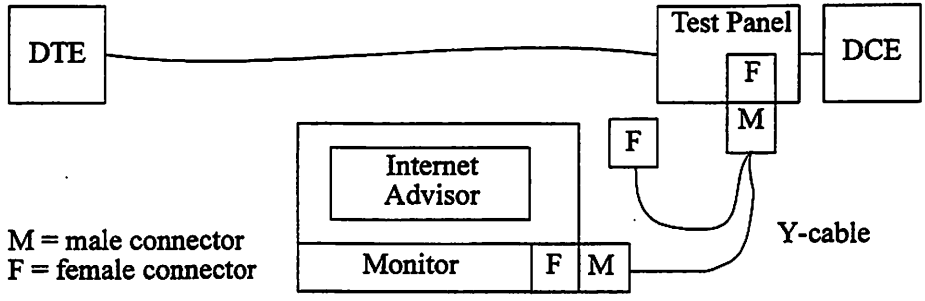

Figure 2-3: V-Series Passive Monitor Test Panel Connection

Figures 2-4 and 2-5 show the connection of a V-Series interface to a circuit for simulating or for performing BERT. In these cases, the Advisor supplies (or transmits) data and control signals to the interface.

Figure 2-4 shows the connection of the Advisor to a DTE (simulating DCE data traffic sending data to a DTE.) You can configure the Advisor to simulate a DCE to provide stimulus for testing DTEs. You can automatically configure the Advisor for this by loading one of the supplied tests that simulate test calls to a terminal device from X.25 or Frame Relay Networks.

Simulate Connections

Simulation lets the Advisor become a device on the line. This gives you the added capability of interactive testing by injecting data. You can write simulate programs so the Advisor acts as either a DTE or a DCE. For more information on simulation, see chapter 4.

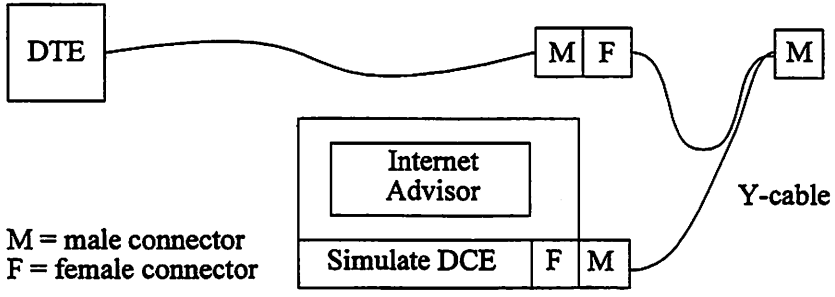

Figure 2-4: V-Series Active Connection to Test Terminal Device

CAUTION

When using a Y-cable to attach the Advisor to a DTE, take care to keep the pins of the unused male connector from inadvertently making contact with any metal object. This is especially true for the V.35 male connector. The signal levels are very low energy, and therefore not dangerous, but accidental short circuits can cause improper operation of the DTE and unreliable data collection by the Advisor.

Figure 2-5 shows the connection of the Advisor to a DCE (simulating DTE data traffic sending data to the DCE.) In this case, the Advisor is configured to simulate a DTE. When you connect the Advisor to a DCE, the Advisor emulates a DTE sending traffic to the DCE to test the entire link or network. You can automatically configure the Advisor for this by loading one of the supplied tests that places an X.25 call or sends Frame Relay data.

This is also the most common method of connecting and executing BERT through a V-Series interface.

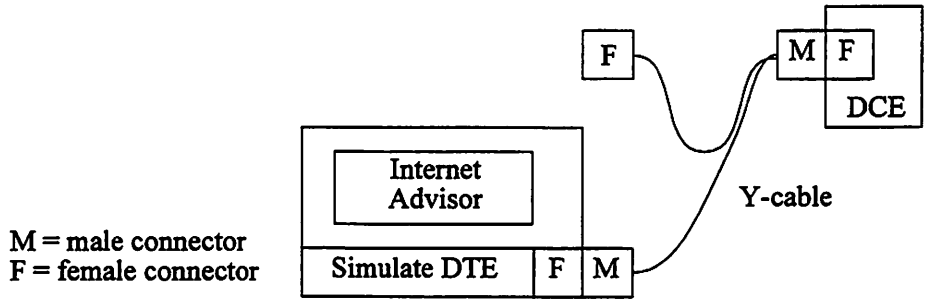

Figure 2-5: V-Series Active Connections to Test DCE and Link

3

The User Interface

The Low Speed Internet Advisor operates with a user interface called the Toolkit. The Toolkit can be customized for your specific testing needs. You can change and create protocol analysis testing tools that maximize the use of the Advisor. You can add to and alter the tests you use frequently, and you can install compatible DOS software to the Toolkit.

The Toolkit

Most Toolkit displays are divided into two parts. The top window is labeled with the function you have chosen and is the operating part of the display. The bottom window is labeled 'Comments' and shows you a comment about the current display.

To move around the Toolkit, use the arrow keys and the **PgUp**, **PgDn**, **HOME**, and **END** keys. The mouse does not function in Toolkit.

Softkeys at the bottom of the display change with most displays and a scroll bar is shown on the right side of the window if there is more than one screen of information.

In many of the setup menus in the Toolkit, you will need to change values. Highlight the choice you want to change (using the arrow keys) and press **ENTER**. Doing this moves the highlight to the fields so you can make your choice. To 'select' your choice, press **ENTER** again. If it is a field that wants you to type in a value, type it in and press **ENTER** for that choice to become active.

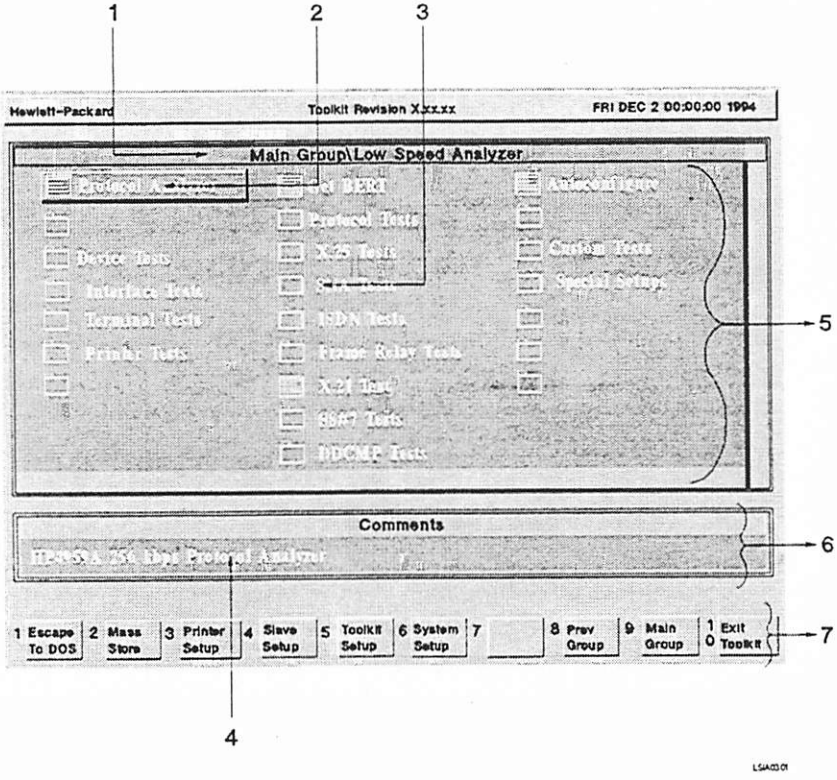

Figure 3-1: Low Speed Analyzer Main Group Menu

The Top Level Menu

The Low Speed Internet Advisor starts in Toolkit.

NOTE

For the HP 4957PC only, start Toolkit by typing `hptools` at the DOS prompt. The Toolkit top level menu is displayed.

Any time you want to leave the Toolkit menu, press **F10** (Exit Toolkit). You may have to press this key more than once to completely exit the application.

The Low Speed Analyzer menu (Figure 3-1) shows:

1. The title of the display you are viewing (in this case, Main Group\Low Speed Analyzer)
2. Tools or tests represented by a page icon
3. Groups of tools represented by a file-folder icon
4. A comment about the highlighted icon
5. The top window (or display) where you select and view tests
6. The bottom window, labeled Comments or Status Window, gives information about a highlighted test or about an application while it is running
7. The softkeys.

If you highlight a tool icon and press **ENTER**, that function will start. In some cases, it may be a test or setup menu.

If you highlight a group icon and press **ENTER**, the Toolkit displays the individual tests in the group, or additional groups.

The softkeys in the Toolkit top level menu provide the following functions:

Escape to DOS	Lets you go to the DOS operating area and do other work without exiting the Toolkit. Type `EXIT` at the DOS prompt when you want to return to the Toolkit menu.
Mass Store	Lets you do various disk functions.
Printer Setup	Lets you set up printer types and printer ports to print data, setups, etc.
Slave Setup	Lets you setup and configure a slave for remote operations.
Toolkit Setup	Lets you configure the Toolkit to add additional tests or special applications, to automatically run tests, and to delete tests you no longer need.
System Setup	Shows you the operating system, machine type, and available memory in your PC. It also lets you select the video mode and sound options for your PC (this instrument uses VGA only).
Prev Group	Returns you to the previous Toolkit window.
Main Group	Returns you to the top level window of the Toolkit.
Exit Toolkit	Exits the Toolkit.

The Toolkit Setup Menu

The Toolkit Setup menu is where you

- Add tools and groups of tests
- Delete tools and groups you no longer need
- Modify existing tools and groups
- Copy and Paste tools and groups

Toolkit Setup Menu Functions

Press **F5** to start the Toolkit Setup menu. The Toolkit Setup menu is displayed and shows the various groups and tools available.

Add a Tool or Group

1. Make sure the highlight is on the tool or group that is BEFORE the position where you want to add a tool or group.

2. Press **F1** (Add Program) or **F3** (Add Group). The Program Information menu is displayed if you are adding a tool. The Group Information menu is displayed if you are adding a group.

3. Use the arrow keys to toggle between the fields and enter your choices.

See the "Program Information Menu" section in this chapter for more details on adding a tool to the Toolkit. See the "Group Information Menu" section in this chapter for more details on adding a group to the Toolkit.

Delete a Tool or Group

1. Highlight the tool or group you want to delete.

2. Press **F3** (Delete). A window asks you to confirm if you want to delete this selection.

Modify a Tool or Group

1. Highlight the tool or group you want to modify.

2. Press **F4** (Modify). The Program Information menu is displayed if you are modifying a tool. The Group Information menu is displayed if you are modifying a group.

3. Use the arrow keys to toggle between the fields and enter your choices.

See the "Program Information Menu" section in this chapter for more details on modifying a tool. See the "Group Information Menu" section in this chapter for more details on modifying a group.

Copy/Paste a Tool or Group

The easiest way to add a tool or group is to copy an existing tool or group and paste it where you want the new tool or group to be. You can then edit this new copy to match your testing needs.

1. Highlight the tool or group you want to copy

2. Press **F5** (Copy).

3. Use the arrow keys to highlight the tool or group that is BEFORE the position where you want to insert the tool or group.

4. Press **F6** (Paste) to insert the tool or group in the Toolkit menu.

You can make multiple copies of a program or group by pressing **F6** more than once. You can also copy and paste individual tools from one group to another or from the main Toolkit menu into a group menu.

The Program Information Menu

The Program Information menu is displayed anytime you add or modify tools (or tests).

When you want to leave the Program Information menu, press **F10** (Exit) if you want to save your choices and put them in the Toolkit, or, if you want to abandon your choices and start over, press **F1** (Cancel).

Pressing either of these keys takes you back to the Toolkit Setup menu.

Label

The name you type in the Label field is what is displayed in the Toolkit main menu or group menu.

Label Example. Type `Call Dispatch` if you are creating a terminal emulation tool that connects electronically with a centralized dispatch system for trouble calls.

Program Path

The program path is the location of an executable file or application. If you know where you want to store the program, you can type the full program path and name here.

Press **ENTER** if you want to browse through the various directories. Another menu appears that shows the disk drive and directory you are currently in. Use the function keys and arrow keys to highlight the program path you want and press **F10** (Exit) to select it. You should make sure the program name entered here has the proper extension of .exe, .hpe, .com, or .bat.

Program Path Examples. `myprog.exe`, `myprog.bat`, `myprog.com`, or `myprog` are all examples of calling specific DOS programs.

Parameters

For DOS compatible programs, you can put anything in this field that would normally follow the program name called at the DOS prompt. The Parameter field is appended after the program path with a space.

Parameter Examples . Many text editors allow calling the editor with the name of the file to be edited immediately following the program name. For example, if the program name were `myeditor.exe` and the parameter were `myfile.txt`, the full DOS call would be `myeditor.exe myfile.txt`.

Start-up Directory

The Start-up Directory is where the test you are adding runs from. Press **ENTER** to browse through the various directories. Another menu shows the disk drive and directory you are currently in.

Use the function keys and arrow keys to highlight the Start-up Directory you want and press **F10** (Exit) when you have selected the Start-up directory.

Comments

You can type in a comment that you want to be displayed in the bottom window of the Toolkit menu when the Label is highlighted.

Comment Example. Type `My special Frame Relay Tests` if you are creating a tool focused on a specific Frame Relay test.

The Group Information Menu

The Group Information menu is displayed when you add or modify groups of tests.

When you want to leave the Group Information menu, press **F10** (Exit) if you want to save your choices in the Toolkit, or, if you want to abandon your choices and start over, press **F1** (Cancel). Pressing either of these keys takes you back to the Toolkit Setup menu.

Label

The name you type in the Label field is displayed as the group name in the Toolkit menu.

Comments

You can type in a comment that you want displayed when the added group is highlighted. The comment is displayed in the bottom part of the Toolkit menu.

Setting up Special Tests

You can setup special tests or groups of tests to make finding problems on your network faster and more efficient.

If you have a particular configuration or setup that you use on a continuing basis, you can "make" your own test in the Toolkit. Then, each time you run this test, you won't have to change the Interface Setup menu or the filters and counters before you can start your test. All of these values can be saved, loaded, and stored just the way you want them.

Setting up a Test in the Toolkit

The easiest way to set up a new test in the Toolkit is to modify or add a group or program from an existing one.

1. Highlight the icon in the Toolkit menu next to where you want your new application to be displayed. (In other words, the new test will be placed AFTER the highlighted test in the Toolkit menu.)

2. Press **F5** (Toolkit Setup).

3. Press **F1** (Add Program). A display titled Program Information is displayed.

    a. Label - type in a label for your test. This is what will be displayed in the Toolkit menu after you are done. Press the down arrow to go to the next field in the Program information menu.

    b. Program Path - type in the ENTIRE path and filename. Use one of the following program names with the path of `c:\hptools\tools\`:
        for low speed applications - `HP 4959A.HPE`

For example, if you are setting up a test to run, you would type in the following:

```
c:\hptools\tools\hp5959a.hpe
```

Press the down arrow to go to the next field in the Program Information menu.

c. Parameters - the parameter field is a file that contains the Interface Setup menu data, filters and counters Setup menu data, and run configuration menu data. Use one of the following parameter names with the path of `c:\hptools\config\`. The default file names for these configuration files are:

for low speed applications - `HP4959A.PDB`

For example, if you are setting up a BOPs test to run on a T1 network, you would type in the following:

```
c:\hptools\config\
```

If you want to use the default configuration files, you can leave this field blank.

Press **F10** (OK) to go back to the Program Information menu.

d. Start-up Directory - type in the name of the directory you want the test to be in while it is running. You can press enter to 'browse' the directories if you are don't know where you want the test to start from.

e. Comments - type in a comment about for your test. This is what will be displayed in the Comment window at the bottom of the Toolkit menu when you highlight your special test.

4. Press **F10** (OK) to exit the Program Information menu.

5. Press **F10** (Exit Setup) to exit the Toolkit Setup menu.

4

Testing with the Low Speed Advisor

The first thing you will most often want to do to test a line is to "monitor" the line. Monitoring lets you watch the line so you can tell whether the line is active and whether there is valid data on the line. While you are monitoring, the Advisor captures data in its internal 768K data buffer (or to the hard disk capture buffer, if it is selected instead). The data is then available for post-run analysis.

To monitor a line, perform the following steps:

1. Connect the appropriate interface connector on the Advisor to the line you want to test. For information on how to connect the Advisor to monitor a line, see the section "Connecting the Advisor to Your Network" in chapter 2, *Startup and Installation.*

CAUTION

If you are going to connect the line to the "External Pod Cable" connector on the Advisor, turn off the Advisor before you connect the proper pod to the external connector. Then turn the power back on.

CAUTION

Connect only one interface cable to the Advisor at a time. For example, do not have both RS-232 and V.35 cables connected to the Advisor at the same time.

2. Tell the Advisor which interface connector is connected to the line by "selecting" that interface in the Run menu. For more information on how to do this, see "Selecting the Interface," later in this chapter.

3. Tell the Advisor what protocol, data code, data rate, and other line parameters are being used on the line so that the Advisor can understand and decode the data on the line. There are two ways to do this:

   a. If you know the line parameters, you can select the line parameters in the Setup menu. For information on how to do this, see "Using the Setup Menu," later in this chapter.

   b. You can use Auto Configure to let the Advisor evaluate the line and configure itself. For information on how to do this, see "Using Auto Configure," later in this chapter.

4. Once you have connected the line to the Advisor, selected the interface, and setup the Advisor, you can start monitoring the line. To do this, press **F5** (Run Menu) and then **F1** (Monitor Line). The Advisor begins monitoring the line and capturing data.

5. Press **F8** (Halt/Exit) when you want to stop the run.

6. Press **F6** (Examine Data) to view the data that was captured. See chapter 5, *Evaluating Data*, for information on examining the data.

Besides simple monitoring, you can create monitor or simulate programs for more complex analyses of data. For example, you can write monitor programs that look for specific events to occur on the line, and you can write simulate programs that cause the Advisor to behave like a DTE or DCE on the line. See "Using Monitor Programs" and "Setting Up to Simulate," later in this chapter for information on writing monitor and simulate programs.

In addition to writing your own monitor and simulate programs, several programs that you can use to make common tests are available in the Toolkit folders. These tests can be loaded from the Toolkit and used as they are, or you can customize them for your own specific needs. See "Using a Pre-Written Monitor Program Supplied in the Toolkit," and "Using a Pre-Written Simulate Program Supplied in the Toolkit," later in this chapter.

Selecting the Interface

The Advisor has three dedicated internal interfaces and it can accommodate one of several external interfaces. Once you have connected the line you want to test to one of the interfaces on the Advisor, you must select that interface in the Run menu.

CAUTION

Only one interface cable should be connected to the Advisor at a time. For example, do not have both RS-232 and V.35 cables connected to the Advisor at the same time.

To select an interface, do the following:

1. Turn the Advisor on and select `Low Speed Analyzer` by pressing **ENTER**.
2. Select `Protocol Analyzer` by pressing **ENTER**. This brings up the Low Speed WAN Interface (4959) menu.
3. Press **F5** (Run Menu).
4. Press **F5** (Select Iface).
5. To select an internal interface, select the softkey corresponding to the interface you want to select: (RS-232C), (RS-449), or (V.35). To select an external interface, select the softkey for (Ext Iface).
6. Press **F8** (Halt/Exit) twice to return to the Low Speed WAN Interface (4959) menu.

The Interface Activity panel (described in chapter 1 under "LEDs") will light an LED to indicate which interface has been selected.

Using the Setup Menu

Before you monitor a line (and also before you monitor the buffer, simulate a device on the line, or view previously captured data), you must tell the Advisor what protocol, data code, data rate, and other line parameters are being used on the line so that the Advisor can understand and decode the data on the line. There are two ways to do this:

- If you know the line parameters, you can select the line parameters in the Setup menu. This section describes how to use the Setup menu.
- You can use Auto Configure to let the Advisor evaluate the line and configure itself. Refer to "Using Auto Configure" later in this chapter for information on using Auto Configure.

To go to the Setup menu, use the following procedure:

1. If you are not already at the Low Speed WAN Interface (4959) menu, select `Low Speed Analyzer` in the Toolkit by pressing **ENTER**, and then select `Protocol Analyzer` by pressing **ENTER**. This brings up the Low Speed WAN Interface (4959) menu.

2. Press **F2** (Set Up) to go to the Setup menu.

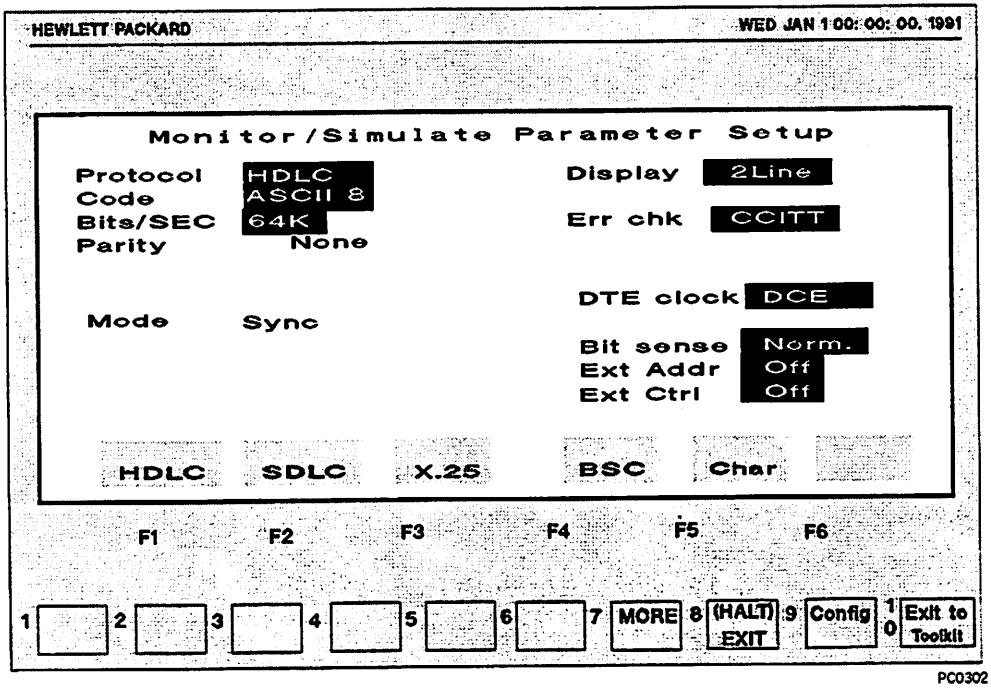

Figure 4-1: The Setup Menu

3. The first step in configuring the Setup menu is to select the protocol being used on the line.

   The Advisor can monitor and simulate BOPs, COPs, and BSC protocols and NRZI (a bit-oriented line encoding scheme). In bit-oriented setups, the Advisor performs automatic zero bit insertion/extraction.

   Move the cursor to the protocol field and, using the sofkeys, select the protocol being used on the line. When you select a particular protocol, the other fields change to let you make selections which are specific to that protocol.

4. Make the appropriate selections for the other fields in the Setup menu. The selections available for the other fields are described in the next sections "Setup Menu Selections for BOPs," "Setup Menu Selections for COPs," and "Setup Menu Selections for Bisync."

Setup Menu Selections for BOPs

HDLC and SDLC are bit-oriented protocols. When either of these is selected as the protocol, the following choices are available in the fields of the Setup menu:

Code	The bit-oriented menus allow ASCII 8, EBCDIC or, using Hex 8, any 8-bit data code.
Display	There are six display formats that are available for bit-oriented protocols. These are: Two Line, DTE only, DCE only, Data and State, Frame, and Packet.
Bits/Sec	Data capture rates from 50 bps to 64 Kbps are available. Except for NRZI, all the selections are supported. NRZI will not work at 16000, 12000, 2000, or 50 bps.
Error Check	CRC-CCITT preset 1 or preset 0.
Mode	All bit-oriented protocols are synchronous. In NRZI mode, the clock is encoded within the data. When NRZI mode is selected, the Advisor will derive its receive clocks from the data on each channel. Also available is EXT NRZI (data using the RC and ETC clock leads).
DTE Clock	DTE data can be synchronized to either a DCE or DTE clock. If this selection is incorrect, only DCE data will be displayed.
Ext Addr (HDLC)	HDLC allows an extended address field. When an additional address octet (byte) is to follow, the first or least significant bit of the address octet is set to 0. The last address octet in a series has the LSB set to 1. Use Frame display format to see the extended address.
Ext Ctrl (HDLC)	HDLC allows a 16-bit control field to handle larger N(S) and N(R) counts. Use Frame display for extended control field.

Setup Menu Selections for Bisync

When Bisync is selected as the protocol, the following choices are available in the fields of the Setup menu:

Code	EBCDIC, Transcode, HEX, and ASCII 7 and ASCII 8 are available.
Display	DTE, DCE, Two Line, and Data and State display formats are available.
Bits/sec	The bit rates for BSC are from 50 bps to 64 Kbps.
Error Check	Select LRC or CRC-16 for ASCII or EBCDIC, and select LRC or CRC-12 for Transcode.
Mode	BSC is synchronous, half-duplex only. The CHAR protocol should be used for full-duplex synchronous COPs.
DTE Clock	The DTE clock can be supplied by the DTE or DCE.
Parity	The Advisor automatically sets correct parity for the chosen code: odd parity for ASCII 7, none for EBCDIC and Transcode. In the simulate mode, BSC is sent with the correct parity. However, if 'send' characters are specified in hex or binary, the parity is allowed to be different from the setup selection.
Sync on	The Advisor automatically chooses the correct sync characters for each data code. The sync characters are: $^{3}_{2}{}^{3}_{2}$ (EBCDIC), $^{1}_{6}{}^{1}_{6}$ (ASCII), or $^{3}_{A}{}^{3}_{A}$ (Transcode). The Advisor requires at least two sync characters for proper framing.
Suppress	The BSC menu lets you suppress most combinations of text, control characters (blue characters on keyboard), idles ($^{0}_{0}$), and nulls ($^{F}_{F}$) from the display. However, suppressed characters are not deleted from the capture buffer.
Bit sense	Either normal or inverted.

Setup Menu Selections for COPs

The Char menu is a general purpose setup menu used to capture most character-oriented protocols, synchronous or asynchronous. There are many codes available. You can select all the parameters to go with your data code. Of course, you can also create setups which make no sense: e.g., an 8-bit data code with a CRC-12 error check or synchronous Baudot.

Using COPs, you can see all bits on the line in synchronous mode if you set the Sync On field to sync on idles.

NOTE The Advisor does not perform zero bit insertion or extraction for bit-oriented protocols when in the Char setup.

When Char is selected as the protocol, the following choices are available in the fields of the Setup menu:

Code	You can select and define: ASCII8, Hex8, ASCII7, Hex7, Hex6, EBCDIC, Transcode, Hex5, IPARS0, IPARS1, Baudot, or EBCD. Do not make either IPARS selection unless you have loaded IPARS_MEC or the results may be incorrect.
Display	Lets you select the display format: Two Line, DTE Only, DCE Only, or Data and State.
Bits/sec	From 50 bps to 64 Kbps synchronous. From 50 bps to 38.4 Kbps asynchronous. Extended asynchronous available on the ROM Applications makes 56 Kbps and 64 Kbps available. Up to 256 Kbps asynchronous with the HS capture application.
Error Check	Select None, LRC, CRC-6, CRC-12, or CRC-16.
Mode	Select synchronous, monosynchronous, or asynchronous (1, 1.5, or 2 stop bits during simulation). The Advisor needs only one stop bit for asynchronous monitoring, even if more are present.

DTE Clock	Specifies that the DTE clock source be supplied from the DTE or DCE.
Parity	None, Even, Odd, Ignore.
Transparent Text Char	You can define a transparent text character in either hex or text. The Advisor does not see the character for drop sync or error checking conditions. Same as DLE in BSC.
Sync on	Selects the sync characters for proper framing. The Advisor requires at least two sync characters (or one for monosync setup) to capture data when monitoring or simulating character oriented protocols. In monosync, it is very important the sync pattern not be found in the data stream.
Drop sync after	Tells the Advisor when to drop sync (stop bringing in data) and start looking for sync characters again.
Start on/ Stop on	Error checking starts on the character immediately after either of the 'start on' characters, but includes the 'stop on' character. The fourth 'stop on' character is an intermediate text character (ITB). The first three 'stop on' characters normally cause sync to be dropped but the ITB character causes the channel to remain in sync. For IPARS and other 6-bit codes, setting the most significant bit in a 'stop on' character to 1 (e.g., changing $^{0}_{D}$ to $^{8}_{D}$) will cause characters which were ITBs not to be ITBs, and vise versa. Press **CTRL + /** to enter an ITB from the keyboard (US).
Suppress	Lets you suppress most combinations of text, control characters, idles ($^{0}_{0}$), and nulls ($^{F}_{F}$) from the display. However, suppressed characters are not deleted from the buffer.
Bit Order/Sense	In most protocols the least significant bit (LSB) is sent first and data is not inverted. However, some protocols (e.g., IPARS) may be different, so the char menu provides bit order and bit sense selections. Hex setup menu entries are always entered in normal bit order and sense. For example, because the standard IPARS is inverted, syncs would be entered as $^{3}_{F}{}^{3}_{E}$ even though they are $^{0}_{0}{}^{2}_{0}$.

The following sections provide more information on making selections in the

COPs Setup menu:

Hexadecimal Entry and Parity

There are several fields in the Char Menu which let you make hex entries:

- sync on
- drop sync
- transparent text
- start on/stop on

When you make a hexadecimal entry in one of these fields, the parity bit is Determined by hexadecimal entry, not the parity setup selection.

Parity Example. When even parity is used with ASCII 7, the sync characters should be $^{9}_{6}{}^{9}_{6}$, rather than $^{1}_{6}{}^{1}_{6}$. Of course, your line may still use $^{1}_{6}{}^{1}_{6}$, even though this would result in a parity for sync characters that is different from other characters.

For hexadecimal entries, the resulting parity bit conforms to the following rules:

- For data codes of 7 bits or less (e.g., ASCII 7 or Baudot) the parity bit is not automatically changed to conform with the parity setup selection.
- For 8-bit data codes (e.g., ASCII 8 or EBCDIC) the parity bit always conforms to parity setup selection.

Sync Characters

The `Sync on` selection determines what sync characters the Advisor looks for. Unless the sync pattern is correct, the Advisor will not capture data. The Advisor requires at least two sync characters (or one sync character in monosync setup) to capture data when monitoring and simulating.

When you do not know the sync characters, select `Sync on Idles` to capture line data even without the correct sync characters. Auto Configure can find the correct `Sync on` characters. You will need to use Bit Shifting in the Examine Data menu to find the correct framing.

NOTE

The Advisor assumes all character-oriented protocols idle in FF. If your line uses some other condition, you must sync on that condition to capture all data on the line.

Drop Sync (Synchronous mode only)

The `Drop sync` field determines where the Advisor drops sync and begins looking for sync characters. If the Advisor did not drop sync, it would bring in all activity on the line, including idles, and not resync properly.

Drop Sync Example. `Drop sync 0 chrs after None`

Select seven characters on which to drop sync. The first character is the 'within text' character. The Advisor only looks for this character if you have chosen 'error checking.' Thus, if you Start on STX and Stop on ETX, the Advisor looks for the 'within text' character between STX and ETX.

To store all data, including idles, enter `Drop sync 0 chrs after None`. Then the Advisor never drops sync and brings in all line data, including idles.

Drop Sync and Error Checking

The `Drop sync` selection interacts with the `Error check` selection in the following ways:

- The first Drop sync character specifies 'within text.' The Advisor looks for this character between the 'Start on' and 'Stop on' error checking limits. When error checking is 'none,' all text is outside, and the Advisor does not look for the first character (except IPARS).
- The first, or 'within text,' character takes precedence over the six 'outside text' characters. If the same character occurs both inside and outside the Start on and Stop on limits, the Advisor drops sync outside text.
- With error checking, the Advisor always drops sync after the BCC character(s) if it cannot find a 'within text' character. For example, if you select CRC-16 error checking, with 'Start on STX' and 'Stop on ETX,' the Advisor drops sync after the two characters following ETX.

Drop Sync Error Checking Example. `Drop sync 1 chrs after` $^{B}_{B}$ $^{F}_{F}$ $^{F}_{F}$ $^{F}_{F}$ $^{5}_{D}$ $^{A}_{4}$ $^{B}_{3}$ causes the Advisor to drop sync one character after the first $^{B}_{B}$ character within the specified error checking limits. If the Advisor does not find the specified 'within text' character, it drops sync either one character after the BCC character(s) or one character after one of the six 'outside text' characters, whichever appears first. A `Drop sync 0 after` $^{B}_{B}$ $^{F}_{F}$ $^{F}_{F}$ $^{F}_{F}$ $^{5}_{D}$ $^{A}_{4}$ $^{B}_{3}$ causes the Advisor to drop sync immediately after the first $^{B}_{B}$ character within the specified error checking limits or 0 characters after one of the other characters.

Utilities for the Setup Menu

Setting Up User Defined Bit Rates

There are two methods for setting up User Defined Bit Rates. The first will set up Toolkit with a UDBR icon in the low speed window and automatically load the file for the user. The second is more general in that it brings the UTILDISK directory into the low speed startup so the user can, from SETUP, select the UDBR or any other file in that directory.

Use the following procedure to place a UDBR page icon in low speed screen:

Step #	Action	Remarks
1	Select Low Speed Analyzer	to get to the low speed folder
2	Press F5	Toolkit Setup
3	Highlight Autoconfigure with the arrow keys	(top row, last on the right)
4	Press F1	Add Program
5	Fill out the following fields as shown:	
	Label: UDBR	then press the down arrow
	Program Path: c:\hptools\tools\hp4959a.hpe	then press the down arrow
	Parameters	press ENTER to configure the sub list
	Auto-load .MEN/.M&D: NO	then press the down arrow
	Auto-load .app: YES	then press the down arrow
	Auto-run: NO	then press the down arrow
	Config File: c:\hptools\config\udbr.pdb	
	Press F10	to return to previous screen
	Startup Directory: c:\hptools\startup	then press the down arrow
	Comments: User Defined Bit Rate Special	
6	Press F10	to exit the configuration

7	Press the right arrow key once (this must be an empty folder)	to realign Toolkit icons
8	Press F3	Delete
9	Press ENTER	answer OK
10	Press F10	Exit Setup

Use the following procedure to allow the UTILDISK directory access in low speed startup:

Step #	Action	Remarks
1	Select Low Speed Analyzer	to get the low speed folder
2	Select PROTOCOL ANALYZER	to get to the green screen
3	Press F7	MORE
4	Press F4	MASS STORE
5	Press F9	CONFIG (blue screen)
6	Enter path into field: c:\hptools\utildisk	writes over the STARTUP file
7	Press F10	EXIT CONFIG (blue screen)
8	Press F2	DIR (green screen, files in directory are listed)
9	Press F9	CONFIG (blue screen)
10	Press F2	MASS STORE (blue screen, this bring up directory)
11	Cursor to desired file	choose UDBR.APP for the User Defined Bit Rate application
12	Press F7	COPY FILE (screen shows two paths, SOURCE is your file selected)
13	Enter the destination path: c:\hptools\STARTUP	
14	Press F10	OK (file copy bar will show completion)
15	Press F10	EXIT CONFIG
16	Press F8	back to the green screen
17	Press F10	EXIT DBM
18	Press F10	EXIT CONFIG
19	Press F8	EXIT

To run the User Defined Bit Rate application, from the top level green screen, select MORE, MASS STORE, select UDBR, LOAD, EXECUTE, then SETUP to set the bit rate.

Using Auto Configure

Rather than using the Setup menu to tell the Advisor what protocol, data code, data rate, and other line parameters are being used on the line, you can use Auto Configure to let the Advisor evaluate the line and configure itself. Auto Configure evaluates data, determines the setup based on the parameters it finds, and puts the Advisor in the monitor mode.

Auto Configure evaluates data on the line and determines what kind of protocol is being used. It can identify character-oriented protocols (COPs), Bisync (BSC), and bit-oriented protocols (BOPs) such as SDLC (NRZ or NRZI) or HDLC (X.25). Then it determines the appropriate data code such as ASCII, EBCDIC, or Baudot. It cannot find IPARS or any inverted data cases. Data rates can be determined from 50 bps to 38.4 Kbps for asynchronous and 1200 bps to 64 Kbps synchronous. More information on how Auto Configure works is given in the section "How Auto Configure Works."

Starting Auto Configure

Once you have connected the Advisor to the line and you have selected the appropriate interface using the Run menu, you can use the following procedure to start Auto Configure:

1. If you are not already at the Low Speed WAN Interface (4959) menu, select `Low Speed Analyzer` in the Toolkit by pressing **ENTER**, and then select `Protocol Analyzer` by pressing **ENTER**. This brings up the Low Speed WAN Interface (4959) menu.

2. Press **F1** (Auto Confg).

   This tells the Advisor to evaluate the line parameters, identify the presence and speed of clocks, look for common sync characters, identify parity and character length, and put these results into the Setup menu.

NOTE

A blinking asterisk is displayed whenever Auto Configure is working. This indicates the instrument is still checking line data.

If a good match is found, the Advisor briefly shows the Setup menu with the new parameters, goes into the monitor mode, and begins displaying data. If a good match is not found, the previous setup is restored. For suggestions on what to do if Auto Configure does not find a good match, see "Using Auto Configure as a Starting Point" and "What to Do if Auto Configure Does Not Work."

3. You can press the (Summary) softkey to review the setup results at any time. To change the display format, or any other setup parameter, halt the run, and go to the Setup menu to modify the setup.

How Auto Configure Works

This is the process that the Advisor uses during Auto Configure:

Synchronous Data

The Advisor first looks for a clock to determine whether the data is synchronous or asynchronous. When a clock is present on the line, the Advisor then:

1. Determines the data rate.
2. Looks for idle types. When the data idles in NRZI 7E, the Advisor automatically sets up in SDLC EBCDIC.
3. Sets up for synchronous BOPs when the data idles in non-NRZI 7E.
4. Sets the data code and parity and then checks for BSC when the data idles in FF. If the data is not BSC, it sets up for synchronous COPs.
5. If Auto Configure does not complete the setup within 15 seconds, it repeats the process and tries to auto configure again.

Asynchronous Data

When there is no clock on the line, the Advisor then:

1. Determines the data rate.
2. Looks at idles. If the idles are NRZI, the setup is set at SDLC EBCDIC.
3. Determines how many bits per character if the data idles in FF. The setup is made in ASYNC COPs depending on the bits/character.
4. If Auto Configure stops at any step for 45 seconds, it tries to auto configure again.

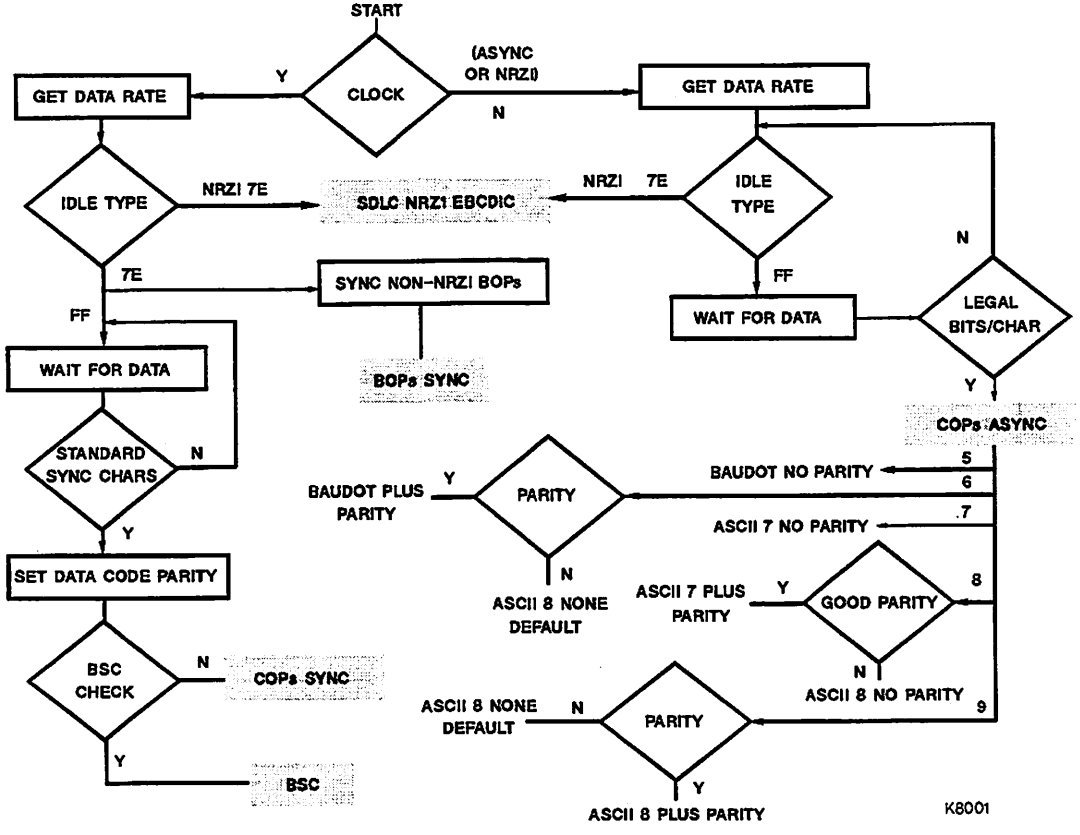

Figure 4-2: Auto Configure Algorithm

Using Auto Configure as a Starting Point

Auto Configure works with most protocols and data codes; however, it might not find all the parameters if the protocol is nonstandard, there is insufficient information, or the data present is not random. Even if Auto Configure does not find all the parameters, it can still provide a starting point for your setup because it usually finds some of the line parameters. The setup parameters that Auto Configure finds are displayed as they are found, but you must reenter these parameters in the Setup menu if Auto Configure completes only a partial setup.

Bit-Oriented Protocols (BOPs)

Auto Configure will set up synchronous, Non-Return to Zero(NRZ), and Non-Return to Zero Inverted (NRZI) BOPs. BOPs are assumed to idle the line in flags (7E). BOPs will be setup as:

Table 4-1: BOPs Setup from Auto Configure

Protocol	Data Code	Parity
X.25	ASCII8	none
HDLC	ASCII8	none
SDLC	EBCDIC (including clocked NRZI)	none

All BOPs default to the Frame display format.

When you are monitoring a BOP line, line indicators should be flashing with clock activity except in the case of monitoring an NRZI line (when simulating NRZI, a clock is put on the interface).

If you use Auto Configure for your initial setup, you need to change the setup in the following cases:

- HDLC with Extended Address or Control -- Change the protocol to HDLC with the following setup:

```
Ext Addr and/or Ext Ctrl: On        Display:Frame
```

- X.25 Packets if the address is not $^{0}_{1}{}^{0}_{3}$ -- If the protocol is X.25, change the setup to the following:

```
Protocol: X.25          Display: Packt
```

You can use any of the six display formats for BOPs. For frame (level 2) decoding, use the Frame display format. For packet (level 3) decoding, use the Packet display format.

To observe extended address and control on HDLC lines, go to the Setup menu and change the protocol to HDLC. Turn on extended address and/or extended control, and change the display format to Frame.

Character Oriented Protocols (COPs)

Auto Configure always selects the Char setup for character oriented protocols, unless it finds a match with the BSC setup. The sync and control characters in COPs must be standard (i.e., ASCII sync = $^{1}_{6}{}^{1}_{6}$ and EBCDIC sync = $^{3}_{2}{}^{3}_{2}$). COPs must idle the line in FF. COPs will be setup as follows:

Table 4-2: Synchronous COPs Setup from Auto Configure

Protocol	Data Code	Parity	Sync on	Err Chk
BSC	ASCII8	none	$^{1}_{6}{}^{1}_{6}$	LRC or CRC16
BSC	ASCII7	odd	$^{1}_{6}{}^{1}_{6}$	LRC or CRC16
BSC	EBCDIC	none	$^{3}_{2}{}^{3}_{2}$	LRC or CRC16
CHAR	EBCDIC	odd/even	$^{3}_{2}{}^{3}_{2}$	
CHAR	EBCDIC	none	$^{3}_{2}{}^{3}_{2}$	
CHAR	ASCII8	odd/even	$^{1}_{6}{}^{1}_{6}$	
CHAR	ASCII8	none	$^{1}_{6}{}^{1}_{6}$	
CHAR	ASCII7	odd/even	$^{1}_{6}{}^{1}_{6}$ or $^{9}_{6}{}^{9}_{6}$	
CHAR	ASCII7	none	$^{1}_{6}{}^{1}_{6}$	

Table 4-3: Asynchronous COPs Setup from Auto Configure

Protocol	Data Code	Parity
CHAR	ASCII8	odd/even/none
CHAR	ASCII7	odd/even/none
CHAR	Baudot	odd/even/none

All COPs will default to the Two Line display format.

What to Do if Auto Configure Does Not Work

If Auto Configure does not work, do the following:

1. Exit Auto Configure by pressing **F8** (Halt/Exit).

2. Go to the Setup menu by pressing **F2** (Set Up).

   a. Try an 8-bit code, no parity, and no error checking.

   b. To monitor line data when you do not know the sync character, select `Sync on idles` ($^{F}_{F}$) and `Drop sync 0 chrs after None`.

   c. To store all data, including idles, enter `Drop sync 0 chrs after None`. Then the Advisor never drops sync and brings in all data, including idles.

3. After making the above selections in the Setup menu, exit the Setup menu by pressing **F8** (Halt/Exit).

4. Then go to the Run menu and select (Monitor Line). This causes the Advisor to monitor the line and to store data to the capture buffer.

5. Press **F8** when you want to stop the run.

6. Go to the Examine Data menu to view the data in buffer.

NOTE The Advisor assumes that all character-oriented protocols idle in FF. If your line uses some other condition, you must sync on that condition.

The buffer data may look meaningless because of incorrect character framing since the Advisor randomly framed the first character captured. To make the data readable, go to the Examine Data menu and select (Bit Shift) to see the data. Bit shifting does not work when data is brought in Most Significant Bit (MSB) first or if any suppress functions are selected. The Advisor does not shift through the parity bit. Unless you use a code with no parity, you must use trial and error to find the correct framing.

If part of the data still does not look correct with bit shifting, change the data code to one without parity. Then, you can determine the correct sync characters. Change the `Sync on` selection to these characters.

Eliminating Superfluous Data

When you have found the correct framing, you can eliminate idles so the buffer will not fill with them. To eliminate idles in 8 or 9-bit data codes, select `Drop sync 0 chars after` $^{F}_{F}{}^{F}_{F}{}^{F}_{F}{}^{F}_{F}{}^{F}_{F}{}^{F}_{F}{}^{F}_{F}$. To eliminate idles in codes with frame sizes less than 8 bits, you must enter the correct number of 1's in any drop sync byte after the first byte (e.g., $^{7}_{F}$ for a 7-bit code or $^{3}_{F}$ for a 6-bit code). In other words, you must enter the correct character and frame size for the idle character.

Table 4-4: Character Frame Sizes vs. Data Code

Data Code	No Parity	Even or Odd Parity	Ignore Parity
Hex 5 Baudot	5 bits (no parity bit)	6 bits (including parity bit)	6 bits * (parity bit=0)
Hex 6 EBCD IPARS Transcode	6 bits (no parity bit)	7 bits (including parity bit)	7 bits * (parity bit=0)
Hex 7 ASCII 7	7 bits (no parity bit	8 bits (including parity bit)	8 bits * (parity bit=0)
Hex 8 ASCII 8 EBCDIC	8 bits (no parity bit)	9 bits (including parity bit)	9 bits * (parity bit=odd)

* These settings are forced during simulation.

Unusual Protocol Settings

Following is a "build-your-own" menu for Character Oriented Protocols (COPs). Select (Char) as the protocol in the Setup menu. Then use this table as reference, and enter the settings given to the right of the protocol for which you want to set up.

Table 4-5: Unusual Protocol Settings

Protocol	Code	Parity	ErrChk	Sync Char	Transparent Text Char	Mode
Burroughs BASIC	ASCII 7	odd	LRC	$1_6 1_6$	d_1	Sync
						Async 1
Burroughs	ASCII 7	odd,SYNC	LRC	$1_6 1_6$	None	Sync (or Async)
Poll-Sel		even,ASYNC				Async1
HASP	EBCDIC	None	CRC-16	$3_2 3_2$	d_1	Sync
IPARS	IPARS	None	CRC-6	$3_F 3_E$	None	Sync
						Bit-sense invert
						Bit order-MSB first
MODE 4c	ASCII 7	odd	LRC	$1_6 1_6$	d_1	Sync
UNISCOPE	ASCII 7	odd,SYNC	LRC	$1_6 1_6$	d_1	Sync
		even,ASYNC				Async 1
VIP7700	ASCII 7	odd,SYNC	LRC	$1_6 1_6$	d_1	Sync

Using Monitor Programs

Rather than just simply monitoring the line, a more effective way to analyze data is to set up the Advisor to look for specific events. By doing this, the Advisor can 'trigger' on certain events and gather data useful for analysis. Then, the captured data is easy to evaluate.

The Advisor is most efficient if you:

- Write monitor or simulate programs to observe specific events on the line.
- Load previously saved programs and reuse them.
- Load one of the pre-written programs in the Toolkit.

Ease of Programming. The capability to select trigger events lets you efficiently analyze the data you are capturing. Triggers are events you want the Advisor to look for, such as characters, lead changes, or errors.

Once the Advisor finds the designated event, it can beep, highlight the event in the buffer, count events, measure time between events, send data and set leads simulate mode only), or display a message.

Defining Trigger. Triggers must be defined as a reference point. You can define triggers with 'when' statements in your programs. The 'when' statement is used in conjunction with the desired trigger action.

You must tell the Advisor precisely when to start or stop an action or the measurement may be misleading or inaccurate. To use a trigger event as a point of reference, action commands must follow 'when' statements. For example, to start a timer when a certain event occurs, place the 'when' statement first.

NOTE

This section contains an introduction to writing monitor programs, and it contains several example programs. See chapter 11 for a more complete programming reference.

Using the Monitor Menu to Write a Monitor Program

The Monitor menu lets you easily write monitor programs by providing softkey selections.

RTS On to CTS On Program

For example, the following program measures the time from RTS on to CTS on.

1. If you are not already at the Low Speed WAN Interface (4959) menu, select `Low Speed Analyzer` in the Toolkit by pressing **ENTER**, and then select `Protocol Analyzer` by pressing **ENTER**. This brings up the Low Speed WAN Interface (4959) menu.

2. Press **F3** (Mon Menu).

3. Select the (When Trig), (Lead), (RTS), and (On) softkeys. This defines a trigger event that is satisfied when RTS lead goes on.

4. Press **ENTER** to start Block 2.

5. Select the (Start), (Timer), and (1) softkeys.

6. Select the (When Trig), (Lead), (CTS), and (On) softkeys. This specifies a second trigger condition.

7. Press **ENTER** to start Block 3.

8. Select the (Stop) and (Timer 1) softkeys. When the second trigger event is satisfied (CTS goes on), the test stops Timer 1. The result in Timer 1 will be the time interval between RTS On and CTS On.

9. Press **F8** (Halt/Exit) to exit the Monitor menu.

10. Make sure you have connected the appropriate interface connector on the Advisor to the line you want to test, selected that interface in the Run menu, and used the Setup menu to setup the Advisor. Once these things are done, you can press **F5** (Run Menu) and then **F1** (Monitor Line) to run the monitor program.

Here is what the program looks like:

```
Block 1
When Lead RTS goes On          Timer 1 starts measuring
    then goto Block 2
Block 2
Start Timer 1

When Lead CTS goes On          Timer 1 stops measuring
     then goto Block 3
Block 3
     Stop Timer 1
```

Notice the `Start Timer` and `Stop Time` statements are preceded by `When` statements. This causes the Advisor to set a trigger on these lead changes when the specific block is active.

Parity Errors Program

The following program counts the number of parity errors on both the DTE and DCE lines and keeps track of the time the test has run (in minutes).

```
Block 1
When DTE X
     or                        Triggers on any "don't
When DCE X                     care" character
     then goto Block 2

Block 2                        Timer 5 starts when any
Start Timer 5                  character is monitored
                               on DTE or DCE

Block 3
When Error Parity on DTE
     then goto Block 4
When Error Parity on DCE
     then goto Block 5
When Timer 5 is > 59999        Timer 5 counts to 1
      then goto Block 6        minute (in milliseconds)
```

```
Block 4
Increment Counter 1        Counts DTE parity errors
     and then
Goto Block 3

Block 5
Increment Counter 2        Counts DCE parity errors
     and then
Goto Block 3

Block 6
Increment Counter 5        Total test time (in
     and then              minutes)
Reset Timer 5
     and then
Goto Block 2
```

Level 2 When String Program

The following program counts the number of level 2 information frames occurring on the DTE side of a link. It demonstrates that how you can enter level 2 programs using softkey assistance.

NOTE The protocol field in the Setup menu must be set for a bit-oriented protocol (for example, HDLC, SDLC, or X.25) to use level 2 assisted programming.

1. If you are not already at the Low Speed WAN Interface (4959) menu, select `Low Speed Analyzer` in the Toolkit by pressing **ENTER**, and then select `Protocol Analyzer` by pressing **ENTER**. This brings up the Low Speed WAN Interface (4959) menu.

2. Press **F3** (Mon Menu).

3. Select (When Trig) and then select (DTE) to define a trigger for the DTE.

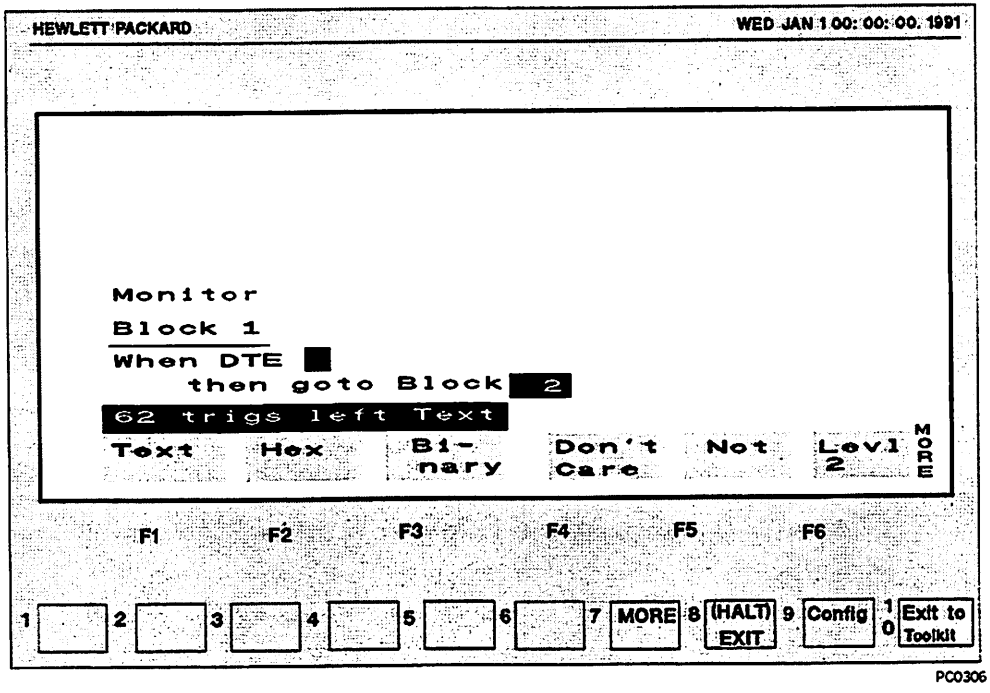

Figure 4-3: Defining a Trigger

4. Select (Levl 2) to enter the level 2 assist mode. The beginning of a frame is displayed with the start flag and the first address character (in hex).

5. For this example, the address is a don't care, so select (Don't Care).

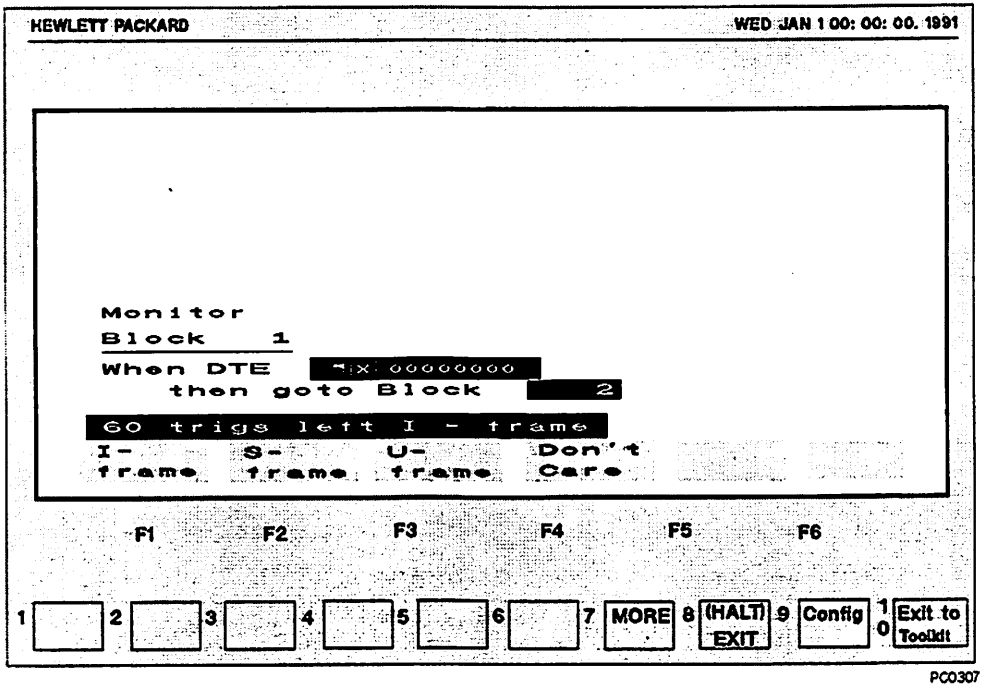

Figure 4-4: Selecting an Information Frame

6. Select (I-frame) to select an information frame.

7. The Advisor prompts you for the send sequence number, N(S). Select (Don't Care).

8. The Advisor prompts you for the poll/final bit, P/F. Select (Don't Care).

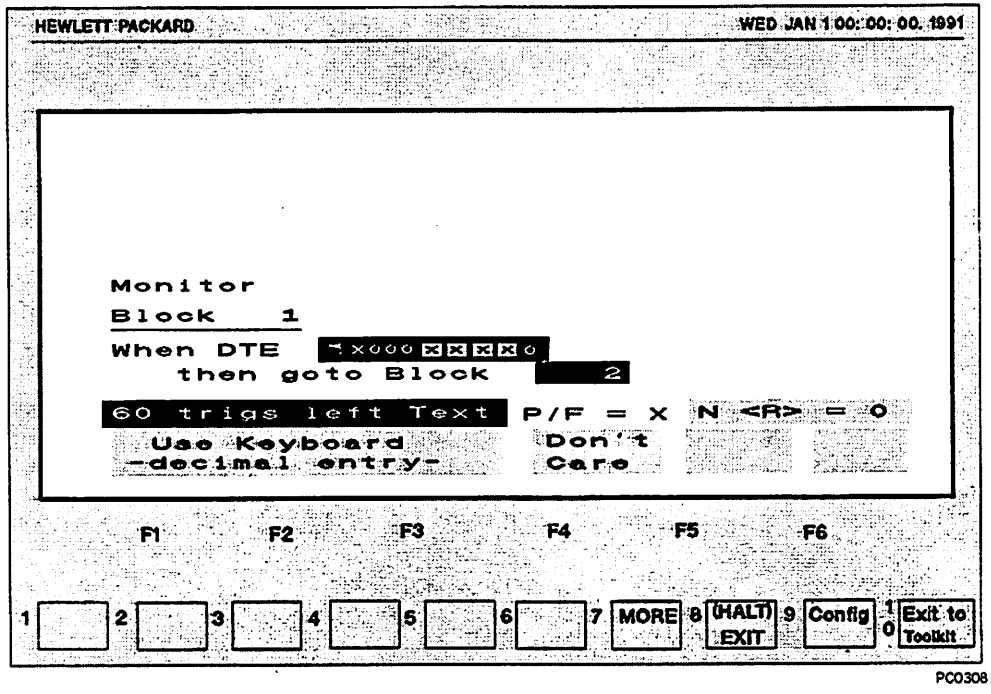

Figure 4-5: Defining Receive Sequence Number

9. The Advisor prompts you for the receive sequence number, N(R). Select (Don't Care). As soon as you make the N(R) entry, the eight-bit control field collapses to an equivalent representation. Notice that a don't care condition is displayed as an X within a box. This byte represents a control field. The question mark indicates the byte contains both don't cares, and 1's or 0's.

10. Press ↓ two times to go to Block 2. (The Advisor defaults with "go to Block 2," which is what we'll use in this example program.)

11. Select (Inc Ctr) and then select softkey (1) to select counter 1. Enter 1 from the keyboard to increment the counter by 1.

12. Select (and then), (MORE), (Goto Blk), and (1). The program now loops back to the beginning and looks for the next DTE Info frame.

Using a Pre-Written Monitor Program Supplied in the Toolkit

In addition to writing your own monitor and simulate programs, there are several pre-written programs that you can use to make common tests on your line. These programs are available in the Toolkit folders. These tests can be loaded from the Toolkit and used as they are, or you can customize them for your own specific needs.

For consistency and simplicity, all programs in this library are stored with a common set of data communications parameters. These parameters can be changed in the Setup menu to suit your needs.

The setup parameters loaded with all library programs are:

- 9600 bps line speed
- ASCII7, Odd parity for async
- EBCDIC, DCE supplies DTE clock for SDLC
- ASCII8, DCE supplies DTE clock for X.25/HDLC
- Fox messages (have a variety of speeds, parity, and datacodes)

The following example shows how to load a program from the Toolkit's Data Communications Test library (provided with each Advisor). The example program counts the DCE and DTE characters for 1 minute (or 10 minutes) and is useful for checking link throughput, file sizes, etc.

1. If you are in the Low Speed WAN Interface (4959) menu, press **F10** (Exit to Toolkit), and then press **ENTER** (for Yes). This takes you back to the Toolkit.

2. Select 'Terminal Tests' (under the 'Device Tests') and press **ENTER**.

3. Select 'COUNTCHR' and press **ENTER**. This loads the pre-written monitor program, and then the Advisor returns to the Low Speed WAN Interface (4959) menu.

4. If you want to view or modify the program, press **F3** (Monitor Menu). To leave the Monitor menu, press **F8**.

5. When you are ready to run the program, press **F5** (Run Menu) and then **F1** (Monitor Line).

Setting Up to Simulate

Besides monitoring, the Advisor can simulate a device on the line. To do this, you can:

- Write simulate programs to observe specific events on the line.
- Load previously saved simulate programs and reuse them.
- Load one of the pre-written simulate programs in the Toolkit.

Ease of Programming. The capability to select trigger events lets you efficiently analyze the data you are capturing. Triggers are events you want the Advisor to look for, such as characters, lead changes, or errors.

Once the Advisor finds the designated event, it can beep, highlight the event in the buffer, count events, measure time between events, send data and set leads (simulate mode only), or display a message.

Defining Triggers. Triggers must be defined as a reference point. You can define triggers with 'when' statements in your programs. The 'when' statement is used in conjunction with the desired trigger action.

You must tell the Advisor precisely when to start or stop an action or the measurement may be misleading or inaccurate. To use a trigger event as a point of reference, action commands must follow 'when' statements. For example, to start a timer when a certain event occurs, place the 'when' statement first.

Before you run a simulate program, however, you must connect the Advisor to the line and you must set up the Advisor. Use the following procedure:

1. If you want to connect the line to one of the internal interface connectors on the Advisor, connect the internal interface connector to the line using the appropriate Y-cable.

   If you want to connect the line to the external interface connector, turn the Advisor off first.

CAUTION Be sure to turn off the power before you attach an external pod.

a. Connect the external connector to the line using the appropriate pod and Y-cable.

b. Turn the power back on, select `Low Speed Analyzer` and press **ENTER**.

c. Select `Protocol Analyzer` and then press **ENTER**.

2. Select the internal or external interface in the Run menu as described in "Selecting the Interface," earlier in this chapter.

3. Press **F2** (Set Up) and configure for the line parameters as described in "Using the Setup Menu," earlier in this chapter.

Once the Low Speed Internet Advisor is connected to the line and is set up to match the line parameters, you can create a simulate program or load an existing simulate program and then run it.

Using the Simulate Menu to Write Simulate Programs

Using softkey assistance, you can create simulate programs much like you create monitor programs; however, simulate programs are written in the Simulate menu, rather than in the Monitor menu.

NOTE This section contains an introduction to writing simulate programs, and it contains several example programs. See chapter 11 for a more complete programming reference.

Example DTS and RTS Simulate Program

The following program causes the Low Speed Internet Advisor to simulate a DTE. The program activates the DTR and RTS control signals and then sends data.

1. If you are not already at the Low Speed WAN Interface (4959) menu, select `Low Speed Analyzer` in the Toolkit by pressing **ENTER**, and then select `Protocol Analyzer` by pressing **ENTER**. This brings up the Low Speed WAN Interface (4959) menu.

2. Press **F4** (Sim Menu), and then select (DTE) to select DTE simulation.

3. Use either ↓ , → , or **ENTER** to move the cursor to Block 1.

4. Select (MORE), (Set Lead), (DTR), and (On).

5. Select (and then).

6. Select (MORE), (Set Lead), (RTS), and (On).

7. Select (and then) and (Send). Fill in the displayed frame (flags and FCS) with data you want to send.

8. Select (Halt/Exit) to go back to the Low Speed WAN Interface (4959) menu.

9. Once you have followed the procedure in "Setting Up to Simulate," you can select (Run Menu) and then (Simulate) to run the program.

Here is what the program looks like in the Simulate menu:

```
Simulate DTE

Block 1
Set Lead DTR On
     and then
Set Lead RTS On
     and then
Send ¶ABCDEFGH GG▶
```

Level 3 When String Simulate Program

The Send command is available only in the Simulate menu. The following example program is for X.25 simulation. A similar method of entry can be used to create a level 2 string program.

1. If you are not already at the Low Speed WAN Interface (4959) menu, select `Low Speed Analyzer` in the Toolkit by pressing **ENTER**, and then select `Protocol Analyzer` by pressing **ENTER**. This brings up the Low Speed WAN Interface (4959) menu.

2. Press **F2** (Set Up). Make sure that the X.25 protocol is selected, and then press **F8** (Halt/Exit).

3. Press **F4** (Sim Menu). Select (DTE) and then (Send).

4. Select (MORE) and then (Levl 3). The first two bytes are $^{0}_{0}$. These are the level 2 address and control bytes, which default to 0.

NOTE

If you want to change the level 2 address and control bytes, move the cursor back to these bytes. You then drop out of the level 3 assisted mode. Select (Levl 2) for assistance in entering these bytes.

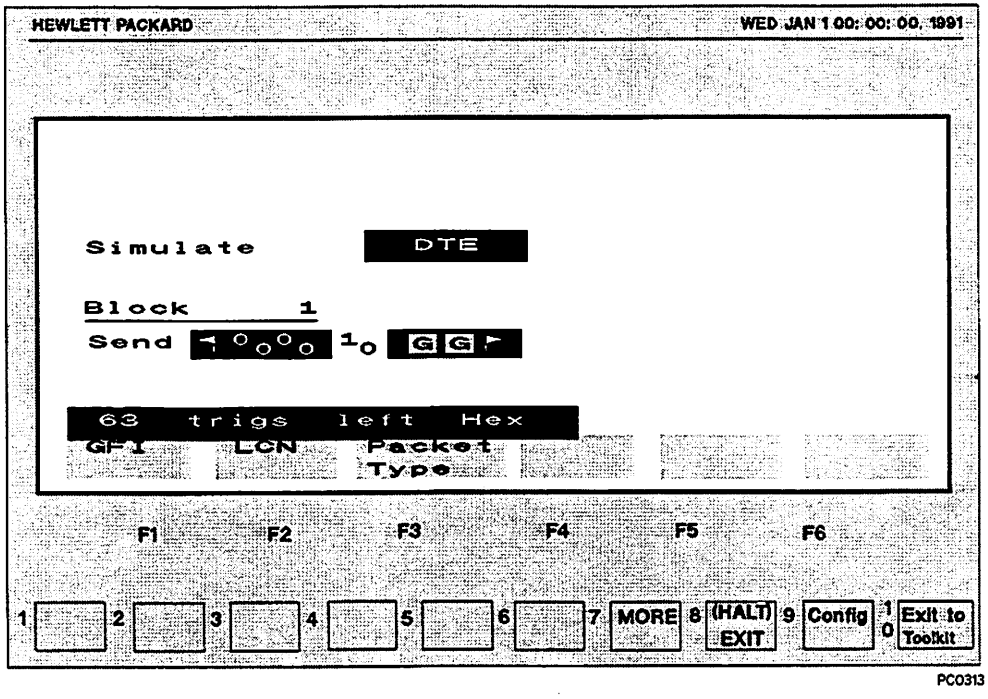

Figure 4-6: Selecting Level 3

5. Select (GFI). This is the General Format Identifier. The far right byte is expanded to its binary components. The cursor is over the left-most bit, prompting you to enter the Q bit. Select the (0) softkey.

6. The cursor moves to the second bit from the left, prompting you to enter the D bit. Select the (1) softkey.

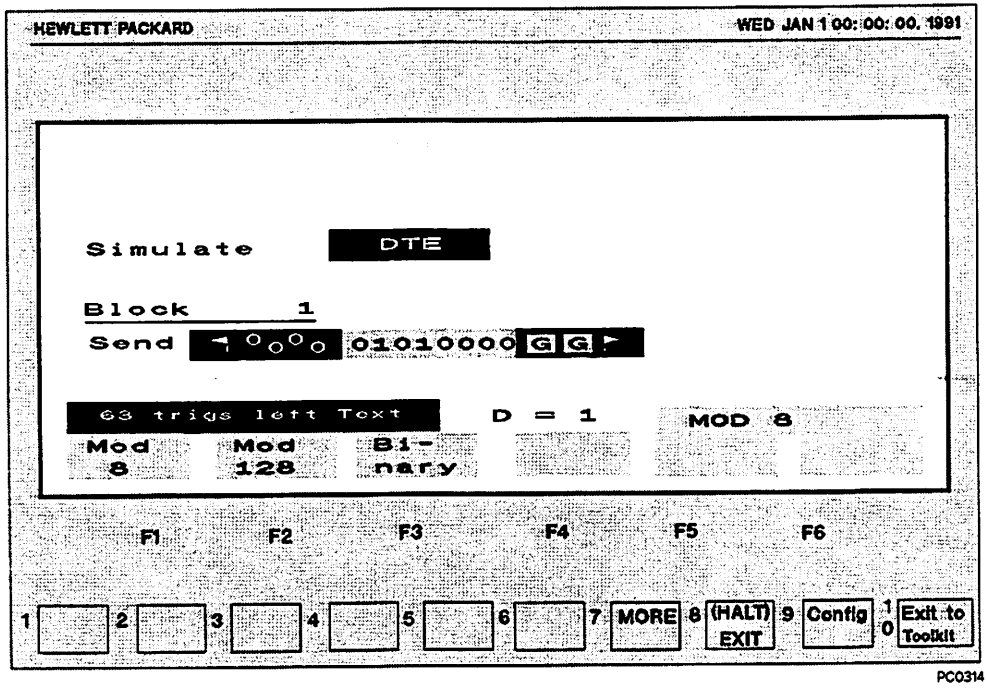

Figure 4-7: Selecting GFI

7. The cursor now moves to the two-bit modulo field. Mod 8 is 01 binary and mod 128 is 10binary. Select (Mod 8).

8. The cursor now moves to the far right and prompts you to enter an LCGN. This is a four-bit field, so you can enter any number from 0 to 15. Type 09 (you must enter a leading zero before the 9). The GFI field collapses to $^{5}_{9}$, and the next byte appears, prompting you to enter the LCN.

9. From the keyboard, type 155. You can enter any three decimal digits or any two hexadecimal digits for the eight-bit LCN field. If you enter a number greater than 255, the entry defaults to 255. The LCN field collapses to $^{9}_{B}$ (the hex equivalent of 155).

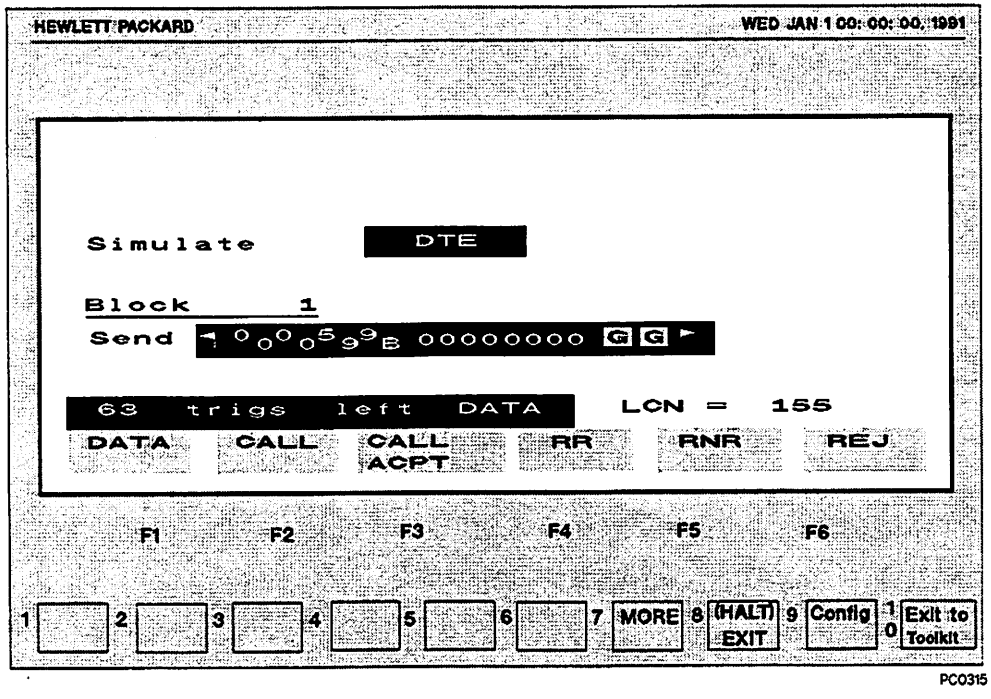

Figure 4-8: Mod 8 and LCN in Level 3 Send String

10. Select (Data) for the packet type. The right-most bit remains 0 and the prompt moves left to the three-bit P(S) field. Enter 7 for the P(S).

11. The cursor moves to the fifth bit from the right, prompting you to enter the M bit. Enter 0 for the M bit. The prompt now moves to the last three bits on the left, which is the P(R) field. Enter 5 for the P(R).

12. The packet-type byte collapses to its hex equivalent, $^{A}_{E}$, and the cursor moves to the data field, prompting you to enter text.

13. From the keyboard type `This is a data packet.`

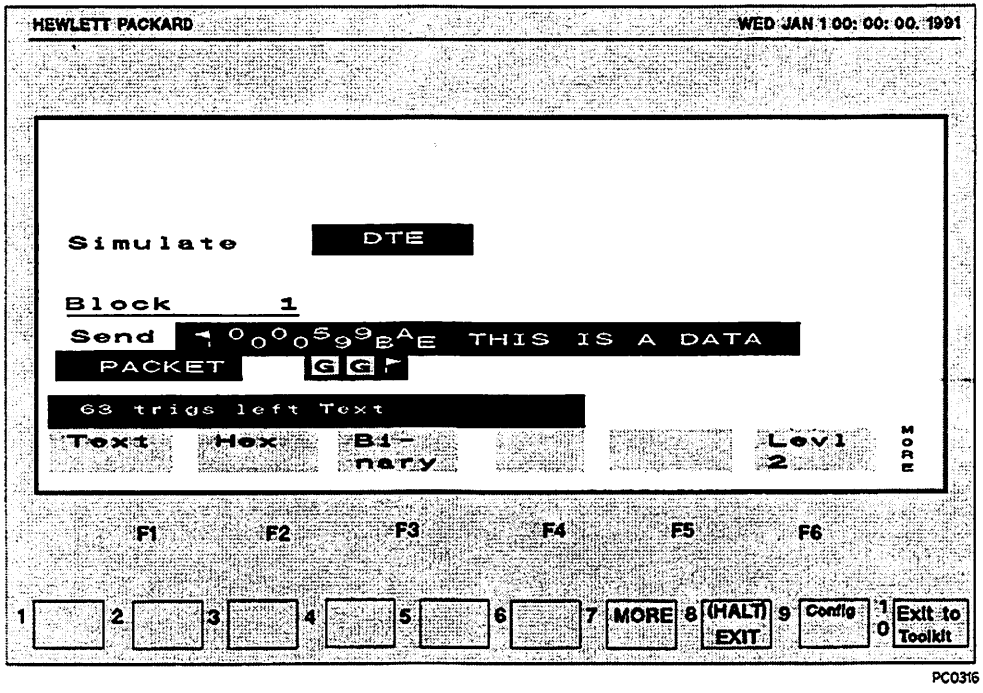

Figure 4-9: Entering Data in a Level 3 Send String

14. Press **F8** (Halt/Exit) to return to the Low Speed WAN Interface (4959) menu. The Simulate program is automatically stored.

15. Once you have followed the procedure in "Setting Up to Simulate," you can send the string by pressing **F5** (Run Menu), and then **F3** (Simulate).

Using a Pre-Written Simulate Program Supplied in the Toolkit

There are several pre-written Fox Message programs, available in the Toolkit, which use various data code, baud rate, and parity setups. They are located under the Terminal and Printer tests.

The following procedure loads the "FX24007E" Fox Message simulate program which checks the ability of asynchronous terminals and printers to receive and display data.

1. Connect the Advisor to the line as described in "Setting Up to Simulate." (If you want to just look at the program, you don't need to connect the Advisor to the line.)

2. If you are in the Low Speed WAN Interface (4959) menu, press **F10** (Exit to Toolkit), and then press **ENTER** (for yes).

3. Select `Terminal Tests` (under `Device Tests`) and press **ENTER**.

4. Select `FoxFlow Tests` and then press **ENTER**.

5. Select `FX24007E` and then press **ENTER**. This loads the program into the Simulate menu, makes the appropriate selections in the Setup menu, and starts the program running.

Storing Information to Disk

There may be times when you want to store data you captured in the capture buffer so that you can analyze it later. For example, you may want to capture data at various times and then look for problems that occur at certain times on your network.

You can also store data directly to the hard disk while you are running at 64 Kbps or less. This lets you take advantage of the Advisor's larger hard disk buffer. See "Capturing Data to Disk While Running at 64 Kbps or Less" for information on how to capture data to the hard disk.

In addition to storing data, you can also save the state of the Advisor's menus, menus and data, and applications. You can save data, menus, menus and data, and applications to either the hard disk or to a floppy disk. See "Storing to a Floppy Disk" and "Storing to the Hard Disk" for procedures.

The Advisor stores different information depending on the file type you choose:

Table 4-6: Information stored with Each File Type

File Type	DOS Extension	Stored Information
Data	.BUF	Previously captured buffer data stored to disk or hard drive
Menu	.MEN	Setup, monitor, simulate and BERT menus
Menu & Data	M&D	Setup, monitor, simulate, BERT menu and data that was captured
Application Program	.APP	Application program resident in instrument memory
Extended Menu	.EXM	Setup, monitor, simulate, BERT, printer, data filter (including menus containing External NRZI or X.21 protocols)

Storing to the Hard Disk

1. If you are not already at the Low Speed WAN Interface (4959) menu, select `Low Speed Analyzer` in the Toolkit by pressing **ENTER**, and then select `Protocol Analyzer` by pressing **ENTER**. This brings up the Low Speed WAN Interface (4959) menu.

2. Press **F9** (Config). The default hard disk drive, `C:\HPTOOLS\STARTUP`, is shown in the Current Mass Store Directory field.

3. Change the Current Mass Store Directory to `C:\HPTOOLS\xxxx` where "xxxx" is the directory that you want to store your file in. Make sure you use a valid path.

4. Press **F10** (Exit Config).

5. Press **F7** (MORE), and then press F4 (Mass Store).

6. Press **F4** (Store).

7. Name the file you want to store (up to 8 characters).

8. Press ↓, and press the softkey that corresponds to the file type. See Table 4-6 for what is actually stored in each file type. The proper extension is automatically added to the file name.

NOTE Always save captured data as type Menu and Data.

9. Press ↓ and enter a comment for the program. This is optional.

10. Press **F6** (Execute).

Storing to a Floppy Disk

1. If you are not already at the Low Speed WAN Interface (4959) menu, select `Low Speed Analyzer` in the Toolkit by pressing **ENTER**, and then select `Protocol Analyzer` by pressing **ENTER**. This brings up the Low Speed WAN Interface (4959) menu.

2. Press **F9** (Config).

3. Insert a formatted floppy disk into the floppy disk drive.

4. Change the Current Mass Store Directory to `A:\`.

5. Press **F10** (Exit Config).

6. Press **F7** (MORE), and then press F4 (Mass Store).

7. Press **F4** (Store).

8. Name the file you want to store (up to 8 characters).

9. Press ↓, and press the softkey that corresponds to the file type. See Table 4-6 for what is actually stored in each file type. The proper extension is automatically added to the file name.

NOTE Always save captured data as type Menu and Data.

10. Press ↓ and enter a comment for the program. This is optional.

11. Press **F6** (Execute).

Capturing Data to Disk while Running at 64K bps or Less

While running at 64 Kbps or less, you can store directly to the hard disk while running monitor or simulate programs. To do this, you merely add some additional commands to the program.

If you store to the hard disk, you can take advantage of the larger data buffer available in the hard disk. This is useful when the on-board 768 Kbyte RAM capture buffer is too small. The Advisor comes with a default disk buffer of 5 MBytes, which is already initialized.

To use a larger or smaller hard disk capture buffer, you must first initialize a new disk buffer. See the section, "Initializing a New Hard Disk Capture Buffer" in this chapter for more information.

NOTE The 768K on-board RAM buffer is optimized for high-speed data capture, including 256 Kbps. Use it whenever possible to ensure adequate capture performance.

NOTE Do not write directly to the floppy disk while monitoring or simulating. You can only write to the hard disk.

The following is an example of a monitor program that looks for RTS to go on and then starts capturing data to the hard disk:

1. If you are not already at the Low Speed WAN Interface (4959) menu, select `Low Speed Analyzer` in the Toolkit by pressing **ENTER**, and then select `Protocol Analyzer` by pressing **ENTER**. This brings up the Low Speed WAN Interface (4959) menu.

2. Press **F3** (Mon Menu).

3. Select (When Trig), (Lead), (RTS), and (On), and then press **ENTER**.

4. Select (Start) and then (Disc).

5. Press **F8** (Halt/Exit).

6. Press **F5** (Run Menu) and then **F1** (Monitor Line).

Data is stored to the hard disk.

NOTE

When you are done, you must use the Disk Buffer Extract menu if you want to permanently save the file. See "Saving Data Captured to Hard Disk During Run-Time." If you do not do this, the data is overwritten the next time you capture to the disk.

Storing to Disk Example

```
Block 1
When Lead RTS goes On
     then goto Block 2

Block 2
Start Disk
```

Saving Data Captured to Hard Disk During Run-Time

After capturing data to the hard disk during run-time, you must save the data to a DOS file. If you do not save the data to a file, it will be overwritten the next time you store data to the hard disk. It is a good idea to get in the habit of *ALWAYS* saving your data. To save the data, refer to the procedure in "Saving Data with the Disk Buffer Extractor." See "Disk Buffer Extractor Field Definitions" for more information on the Disk Buffer Extractor.

Saving Data with the Disk Buffer Extractor

1. If you are not already at the Low Speed WAN Interface (4959) menu, select `Low Speed Analyzer` in the Toolkit by pressing **ENTER**, and then select `Protocol Analyzer` by pressing **ENTER**. This brings up the Low Speed WAN Interface (4959) menu.

2. Press **F9** (Config).

3. Press **F9** (Dsk Buf Extract). Buffer information is displayed telling you how much data was captured and when it was captured. If there is no data, the Advisor displays a message indicating no buffer exists.

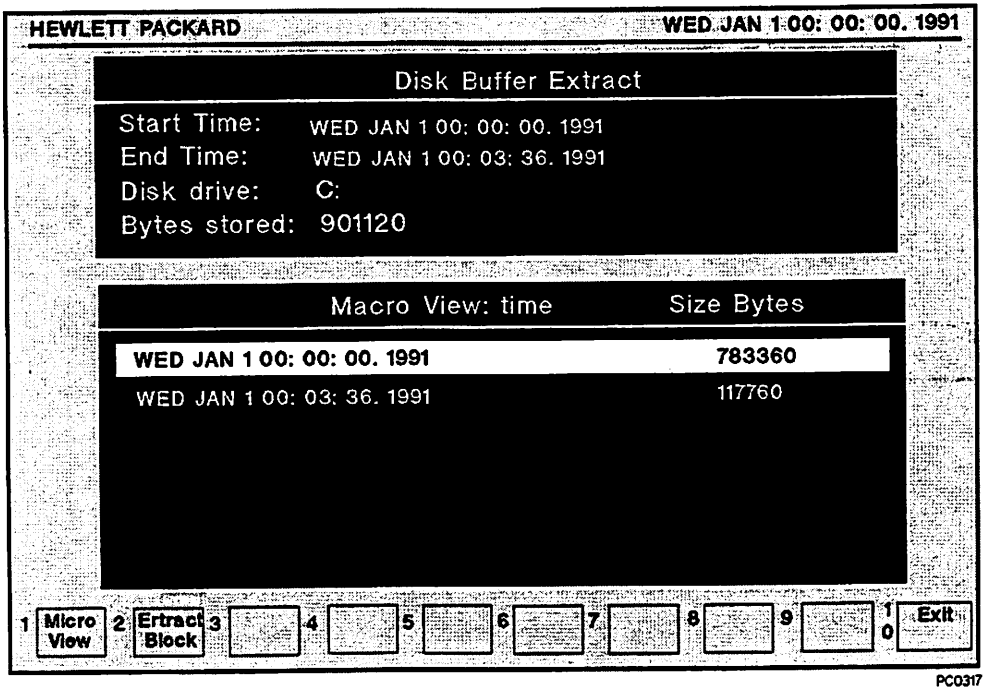

Figure 4-10: The Disk Buffer Extract Menu

4. Press **F2** (Extract Block) to convert the entire block of data that is captured into a file. You are prompted for a file name. Enter a filename and press **ENTER**.

NOTE

The file name must have an .m&d extension. The Advisor attaches the extension (you do not need to type it). When you enter the file name, include the drive, directory, and subdirectory.

Or, press **F1** (Micro View) to view smaller blocks of data.

a. After pressing Micro View, you can place several smaller blocks of data into a single data file. Place the cursor on the first block of data you want to save and press **F2** (Start Marking). The top of the screen displays the time stamp that you started marking on. The time stamp is attached at the end of the data block.

b. Press ↓ until you reach the end of the block of data you want to extract. Press **F3** (Extract). The Advisor prompts you for a filename.

c. Enter the filename and press **ENTER**.

NOTE

The file name must have an .m&d extension. The Advisor attaches the extension (you do not need to type it). When you enter the file name, include the drive, directory, and subdirectory.

A menu and data file is created. The comment for this menu and data file is the timestamp of the last block of data. You can repeat this procedure to extract more blocks of data in separate files.

Disk Buffer Extractor Field Definitions

The Disk Buffer Extractor has `Macro View` and `Micro View` menus you can select from.

Macro View. You first enter the macro view screen. This displays the bytes that were captured, when they were captured, and where they are stored.

The Macro View screen has two windows. The top window contains the following information:

- Start Time - the first time stamp
- End Time - the last time stamp
- Disk drive - the active disk drive
- Bytes stored - the total amount of data stored
- Disk buffer size (bytes) - the size defined in the Disk Buffer Manager

The time stamp is attached at the end of the data block. The bottom window contains the Macro View of total time and total bytes.

Micro View. Only the bottom window changes in the Micro View screen. The Macro View time and byte information is detailed in smaller portions. You can select any part of the Micro View information using the Start Marking function.

When you press **F2** (Start Marking), you can move the cursor and select more blocks that can be extracted into one file. This allows you to selectively save data and define your files with only pertinent data.

When you have selected all of the data for a file, press **F10** (OK).

Initializing a New Hard Disk Capture Buffer

The Advisor can store data from the line directly to a hard disk capture buffer. This is useful when the on-board 768 Kbyte RAM capture buffer is too small. The Advisor comes with a default disk buffer of 5 MBytes, which is already initialized.

To use a larger or smaller hard disk capture buffer, you must first initialize a new disk buffer. Initialization involves finding the largest continuous free space on the hard disk and allocating it to the disk buffer. Allocating contiguous space is necessary to keep up at high data rates under high utilization.

NOTE The 768K on-board RAM buffer is optimized for high speed capture, including 256 Kbps. Use it whenever possible to ensure adequate capture performance.

Disk Buffer Definitions

Largest Possible Disk Buffer. The largest block of contiguous space available on the disk drive. If this is less than the total available disk space, you should pack the hard disk to eliminate fragmented files.

Suggested Disk Buffer. Either the largest possible disk buffer or half of the total available disk space, whichever is smaller.

NOTE Creating a disk capture buffer larger than half of the total available disk space is not recommended. Doing so may not leave enough disk space to store captured data after each run.

Disk capture buffer status shows whether or not a disk buffer already exists on the selected drive. It should show no disk buffer.

NOTE Disk capture buffers should only be created on hard drives.

To initialize a new hard disk capture buffer, do the following:

1. If you are not already at the Low Speed WAN Interface (4959) menu, select `Low Speed Analyzer` in the Toolkit by pressing **ENTER**, and then select `Protocol Analyzer` by pressing [**ENTER**. This brings up the Low Speed WAN Interface (4959) menu.

2. Press **F9** (Config).

3. Press **F8** (Dsk Buf Manager). Hard disk information is displayed at the top of the screen. Total available disk space is the amount of free space left on the disk drive.

4. To select the hard drive where the disk buffer is to be created, move the cursor to the Disk Drive Selection field and press **ENTER**, move the cursor to the desired drive and press **ENTER** again.

5. To select the size of the disk buffer, move the cursor to the Disk Buffer Size field. You can backspace over the default number and type the desired size into the field (in bytes). Press **ENTER**. The number is rounded down to the nearest valid value.

6. Press **F1** (Create Buffer).

NOTE If a disk buffer already exists, a message is displayed. You must delete an existing buffer (using **F4**) before creating another buffer.

7. Press **ENTER** to confirm creating the indicated disk buffer.

CAUTION Initializing a Disk Capture Buffer directly manipulates the disk drive's FAT table. This must not be done while running under Windows 3.0, OS/2, or most other similar Graphical User Interfaces (GUIs) or operating systems. Creating or deleting Disk Capture Buffers should only be done under DOS.

CAUTION Do not use double spacing in DOS 6.0. It is incompatible with the runtime hard disk storage.

8. Press **F10** (Exit DBM), then **F10** (Exit Config).

5

Evaluating Data

This chapter explains how to use the Examine Data menu to evaluate your captured data and how to apply programs to analyze, measure, and manipulate data. For each example and exercise, it is assumed that data is already available for analysis. The examples use data that is on your Utility disk, c:\hptools\utildisk\demodata.m&d.

The capture buffer is 768 Kbytes of memory dedicated to storing your data. It is used to hold your data until you can extract it and evaluate it. You can look at, examine, and measure the contents of the capture buffer in the Examine Data menu by scrolling through the data with the (Roll UP), (Roll Dn), (Next Page), and (Prev Page) softkeys. You can also analyze the contents of the buffer using monitor programs.

Using the Examine Data Menu

Use the Examine Data menu to view buffer data. The following procedure uses the demonstration data, `DEMODATA.M&D`,'from the Utildisk directory.

Looking at Buffer Data

1. If you are not already at the Low Speed WAN Interface (4959) menu, select `Low Speed Analyzer` in the Toolkit by pressing **ENTER**, and then select `Protocol Analyzer` by pressing **ENTER**. This brings up the Low Speed WAN Interface (4959) menu.

2. Press **F9** (Config) and change the Mass Store directory to `c:\hptools\utildisk`.

3. Press **F10** (Exit Config).

4. Go to the Advisor Mass Store display by pressing **F7** (More) and then pressing **F4** (Mass Store).

5. Use the arrow keys to highlight the `demodata.m&d` file.

6. Press **F7** (More) until **F3** is labeled (Load).

7. Press **F3** (Load) and then press **F6** (Execute).

8. Press **F8** (Halt/Exit) to return to the Low Speed WAN Interface (4959) menu.

9. Press **F6** (Exam Data). The Advisor searches the capture buffer for data and displays it using the most recent display format selected.

NOTE

The Advisor always displays a directory of the active DOS directory. This can be changed at any time by pressing **F9** (Config) and entering a different directory.

10.Press → to highlight the 'A' in the data stream.

You can see the data is ABCDEFGH transmitted continuously. With the cursor highlighting the 'A', you can see the character decoded in binary, octal, and hexadecimal at the top of the display. The data is DCE data, so it is displayed in inverse video. The DTE data is displayed in normal video.

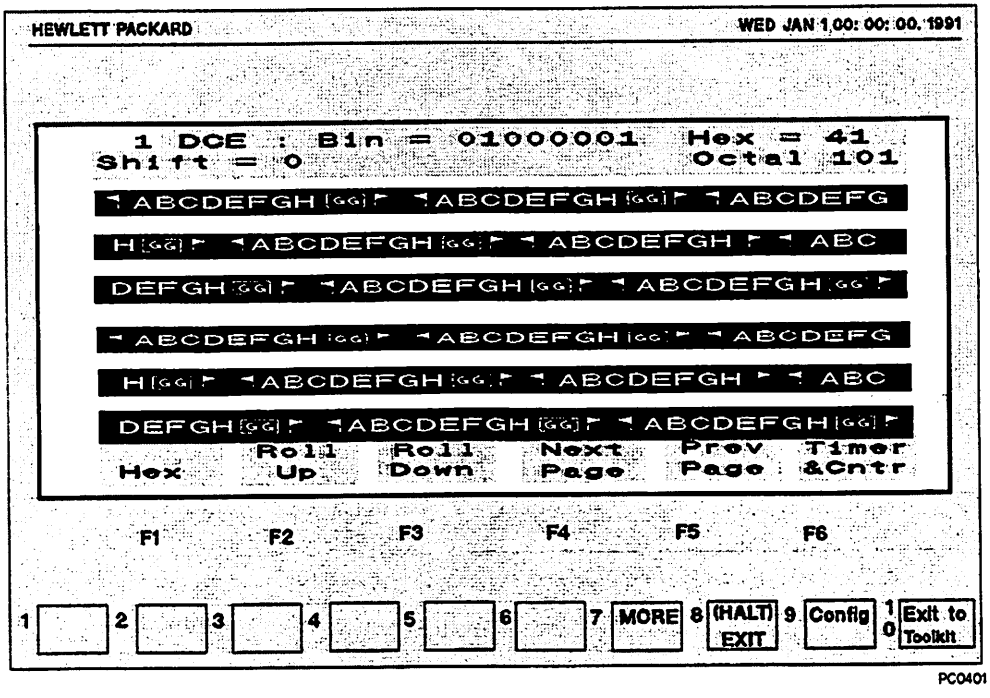

Figure 5-1: Demonstration Data in Two Line Format

Changing the Display Format

1. In the Examine Data menu, select (Chang Dsply) to access the display format softkeys.

2. Press the softkey for the most meaningful data representation.

You can press the Hex softkey and change all data to hexadecimal display and press the same softkey, now labelled Text to change it back.

You have six options that allow flexibility and ease of viewing. Choose the display that best suits your needs:

- Two Line displays both DTE and DCE data
- DTE Only
- DCE Only
- Data & State displays DTE and DCE data with RTS, CTS, DSR, and CD leads
- Frame displays a breakdown of the frame information (BOPs only)
- Packt displays a breakdown of the packet information (BOPs only)

There are two methods you can use to change the display format. There is a softkey in the Examine Data menu that displays the selections available. The Setup menu also contains a field where you can change the display format.

The Advisor is equipped with a "smart cursor" - whenever you change display formats the cursor stays at the same data location.

Measuring Time

You can measure the interval between specific characters using cursor timing in the Examine Data menu.

1. With the cursor still highlighting the 'A', press **F7** (MORE) two times. This should display the **F1** (Start Time) softkey.

2. Press **F1** (Start Time).

3. Press → enough times so the 'A' in the next frame is highlighted.

4. Press **F2** (End Time).

The time between the 'A's is displayed. The measurement should be 99.0 ms. Using this technique, you can measure frame length, from start flag to end flag, 57.0 ms. This difference, from end flag to start flag, measures the delay between frames.

The GG displayed in a box indicates a good frame check, BB indicates bad frame check, and AA indicates abort.

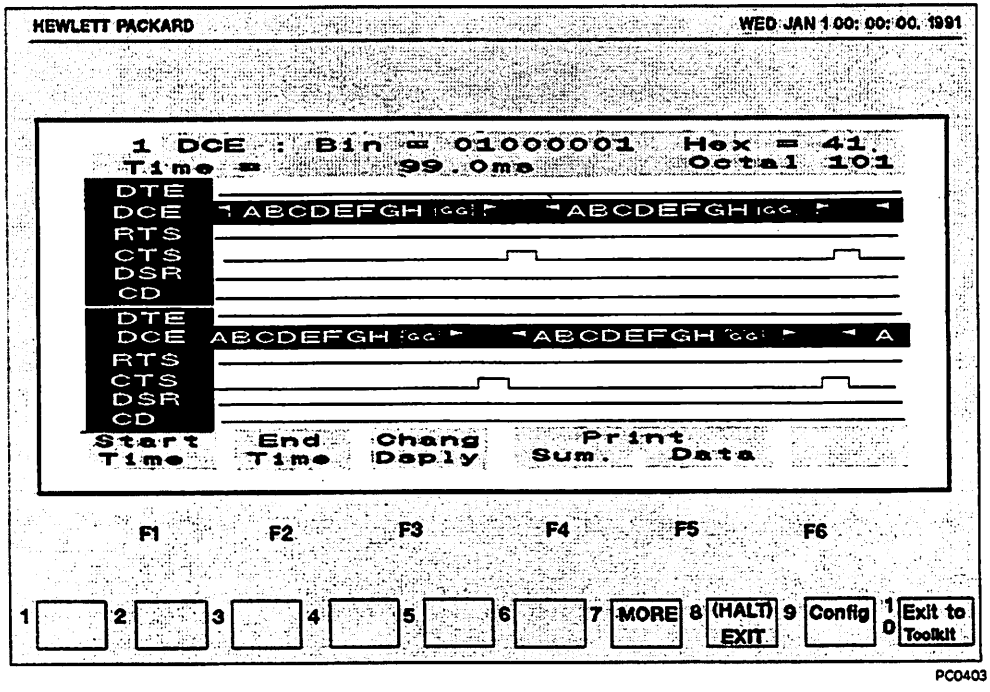

Figure 5-2: Timing Interval in Data & State Format

Analyzing Captured Data

You can evaluate captured data many times and in many ways without corrupting the original data file. When data is in the capture buffer you can view it, make manual measurements, write programs, look for specific events, and run programs from the Data Communications Test Library.

Post-Processing Data

The procedure below creates a program that measures the time between the rising edge of RTS and the rising edge of CTS.

1. If you are not already at the Low Speed WAN Interface (4959) menu, select `Low Speed Analyzer` in the Toolkit by pressing **ENTER**, and then select `Protocol Analyzer` by pressing **ENTER**. This brings up the Low Speed WAN Interface (4959) menu.

2. Press **F3** (Mon Menu). Enter the program listed below. (Monitor programs are also discussed in chapters 4 and 11.)

```
Monitor

Block 1
When Lead RTS goes On
Go To Block 2

Block 2
Start Timer 1
     and then
Highlight
When Lead CTS goes On
Go To Block 3

Block 3
Highlight
```

```
     and then
Stop Timer 1
     and then
Stop Tests
```

3. Press **F8** (EXIT) to go back to the Low Speed WAN Interface (4959) menu.

4. Press **F5** (Run Menu).

5. Press **F2** (Monitor Buff).

6. When the program has finished executing, press **F6** (Exam Data). You can see the transitions that were measured because the program highlighted them.

7. Press (Timer&Cntr). This displays the results of timers and counters.

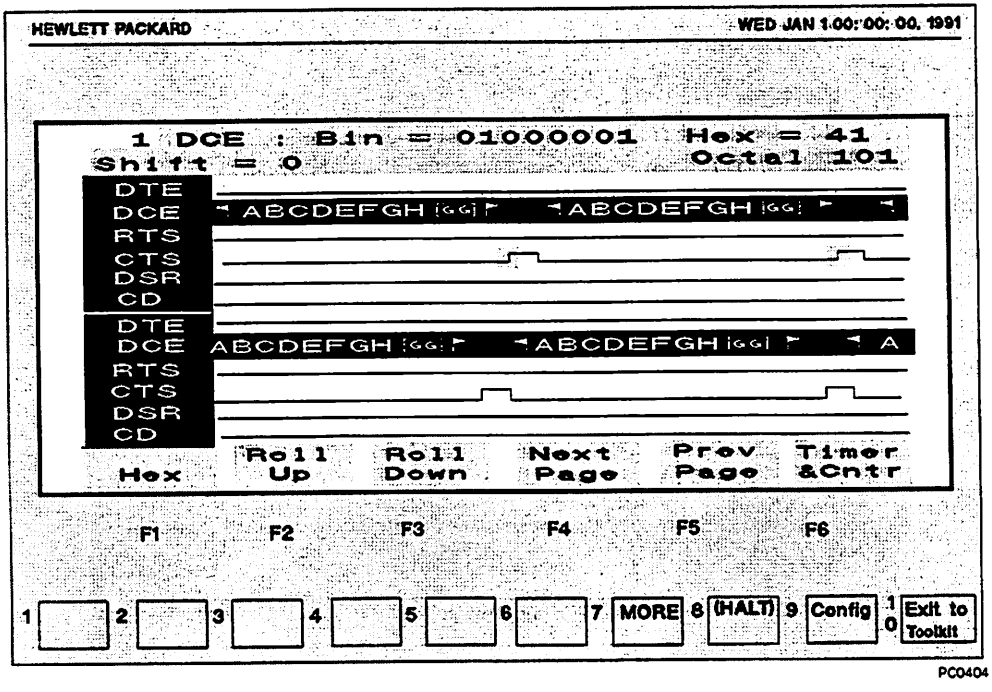

Figure 5-3: Measuring Frame Time from the Buffer

When you view the data in the Data & State display mode, you can see that CTS goes on between frames. Therefore, the time between CTS pulses equals the time for one frame.

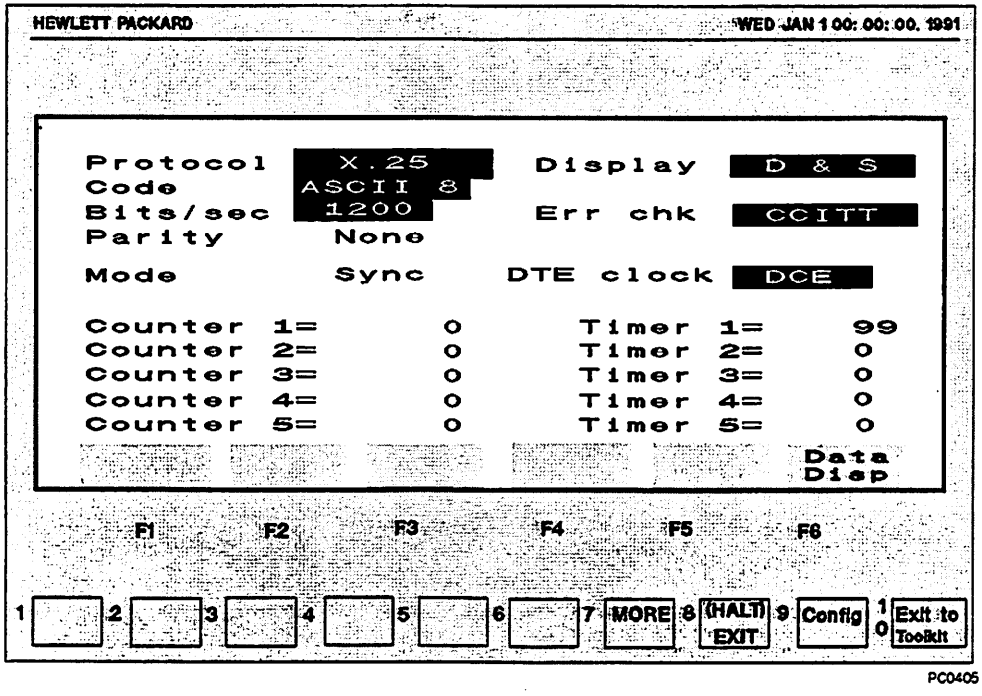

Figure 5-4: Timers and Counters

Timing Resolution

Timing resolution is the smallest unit of measurement that can be timed at a given speed. Use the following table:

Table 5-1: Timing Resolution

Speed	Resolution
50-2400	1.0 msec
3200-4800	0.5 msec
7200-9600	0.2 msec
12000 - 256 kbps	0.1 msec

6

Printing

Display information can be sent to a printer connected and configured to your instrument. You can print monitor/simulate menus, buffer data, and other Low Speed Internet Advisor menus.

The Low Speed Internet Advisor can print:

- buffer data
- monitor and simulate menus
- timer and counter results
- disk directories
- other Advisor menus

Printing Data

For printing, the Advisor Printer Setup menu must be configured and the printer must be connected.

NOTE Characters are printed differently between graphics and text (ASCII) mode printers. The graphics mode printer output is virtually identical to the Advisor's display. The text (ASCII) mode printer output does not appear like the Advisor's display. It is slightly altered, especially when it displays hexadecimal characters.

Connecting the Printer

You can connect your printer to the Advisor's serial or parallel port. The default is LPT1 out the parallel port.

The Printer Setup Menu

A printer should be attached to the Advisor and be able to communicate with it before you try to configure the Printer Setup menu.

The following figure shows the Printer Setup menu configured for a Graphics mode printer connected to a parallel port (LPT1). Whether you have a graphics or text (ASCII) mode printer determines the other Printer Setup menu selections.

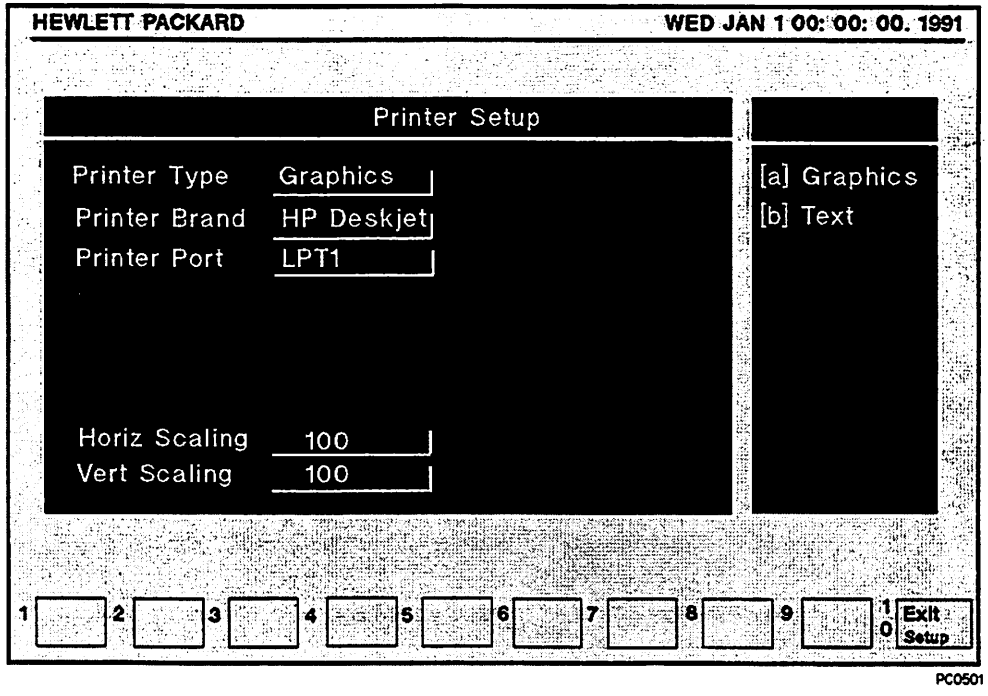

Figure 6-1: The Printer Setup Menu Configured to a Graphics Mode Printer

1. If you are not already at the Low Speed WAN Interface (4959) menu, select `Low Speed Analyzer` in the Toolkit by pressing **ENTER**, and then select `Protocol Analyzer` by pressing **ENTER**. This brings up the Low Speed WAN Interface (4959) menu.

2. Press **F3** to enter the Printer Setup menu. Use the ↑ and ↓ keys to move between the printer setup fields.

3. Press **ENTER** to activate a field, and use the ↑ and ↓ keys to highlight another choice. Press **ENTER** again to make the selection.

The following list explains the purpose of each field in the Printer Setup menu:

Printer Type	Select Graphics printer if your printer is among the list under Printer Brand. Otherwise select Text for standard ASCII printers.
Printer Brand (Graphics print only)	Select the brand of printer being used.
Printer Port	Select LPT1 or COM1.
Baud Rate (COM1 only)	Select from the list of supported baud rates through the serial ports.
Word Size (COM1 only)	Type the number of bits per word, either 7 or 8.
Parity (COM1 only)	Select odd, even, or none.
Stop bits (COM1 only)	Type 1 or 2.
Horizontal Scaling (Graphics print only)	If the default setting of 100 produces a printout that is either too wide or too narrow, change this field to a number between 75 and 110. A smaller number reduces the width of the printout, a larger number increases the width.
Vertical Scaling (Graphics print only)	If the default setting of 100 produces a printout that is either too long or too short, change this field to a number between 75 and 110. A smaller number reduces the length of the printout, a larger number increases the length.

Printing Menus

Select the Advisor's (Print) softkey, which is found in most of the Advisor's menus. The following table is a list of the menus that can be printed. You can also do a Print Screen (a PC print function) to a graphics printer to print the current screen.

NOTE The Print Screen command cannot be used in text mode. If you try to use the Print Screen command in text mode, an error message is displayed.

Table 6-1: Menus that can be Printed

Menu	What is Printed
Setup	all setup parameters from the setup menu (13 lines)
Monitor	the entire monitor program
Simulate	the entire simulate program
Data Filter	the data filter menu (first 13 lines)
Examine Data	Print Sum - Timers and Counters summary (first 14 lines)
	Print Data - selected number of pages (screen fulls of data) of data beginning at the current page or cursor position
BERT	the BERT setup menu (first 13 lines)
BERT Results	the BERT test results display (first 13 lines)
Mass Store Menu	the file directory with the comments

Printing the Buffer

1. If you are not already at the Low Speed WAN Interface (4959) menu, select `Low Speed Analyzer` in the Toolkit by pressing **ENTER**, and then select `Protocol Analyzer` by pressing **ENTER**. This brings up the Low Speed WAN Interface (4959) menu.

2. Select (Exam Data) to enter the Examine Data menu.

3. Press **F7** (More) two times and locate the (Print Data) softkey.

4. Using the arrow keys, position the beginning of the data you want to print on the top line of the screen.

5. Enter the number of pages you want to print. You can print the entire buffer contents or partial buffer contents. If you want to print the entire buffer contents, enter `999`.

6. Select (Execute) to start printing. Data is printed in 'display' pages or screen size. At the top of each page, the block number and the 'display' page number are printed. Data segments with no data to print are printed as blank pages to verify that no data was missed.

7. Press **F8** (Halt/Exit) at any time to stop printing. For example, if you see the data you wanted to print scroll across the screen, you can press **F8** to stop print execution. By the time the print cycle stops, your desired data will have been printed, because there is a delay between the time when data is displayed until it is actually printed.

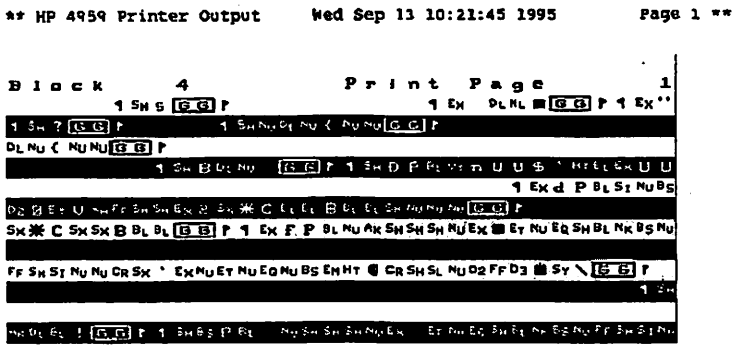

Figure 6-2: Printed Output in Two Line Format (graphics mode)

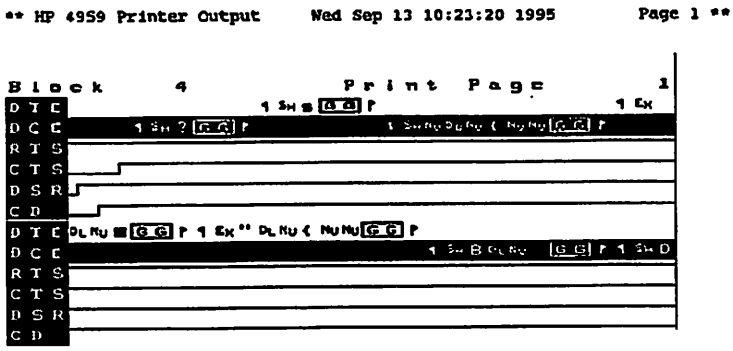

Figure 6-3: Printed Output in Data & State Format(graphics mode)

Text Mode Printers and Printed Characters

Characters are printed differently for graphics and text mode printers. The output for a graphics mode printer is virtually identical to what the Advisor displays. The output format for a text mode printer is the same except:

- All hex codes are in upper case. All ASCII control characters are in lower case. All other sequences are top character upper case, and lower character lower case.
- All characters that have no ASCII representation are printed in hexadecimal mode.

Hexadecimal Characters

Hexadecimal characters are printed in upper case, most significant digit over the least significant digit. For example, B7 hex is printed as:

B
7

ASCII Control Characters

ASCII control characters are printed in lower case with the same mnemonics as displayed except printed on two lines. For example, an ASCII acknowledge is printed as:

```
a
k
```

DCE data that is displayed in total inverse video is printed with an asterisk printed at the end of the line. This is useful for differentiating between DCE and DTE data.

Special Characters

The following table defines special characters and how they are displayed.

Table 6-2: Displayed Special Characters

Message	Display
Don't Care	x
	x
Undefined Character	?
	?
Good FCS	GG
	gg
Abort	AA
	aa
Highlighted Timer	H
	t
Discontinuity	D
	c
Start Flag	S
	f
End Flag	E
	f
Bad FCS	BB
	bb
Don't Care FCS	XX
	xx

Lead levels displayed are printed as follows:
High = 1, Low = 0,
Transition (rising or indeterminate) = /,
Transition (falling or indeterminate) = \.

Getting an ASCII Print File from Captured Data

Use the following procedure to obtain an ASCII print file from captured data:

1. Start with data in the buffer. This can be verified by pressing F6 (Examine Data) and you can return by pressing F8 (Exit) from Examine Data.

2. If the data has not already been stored to disk (such as doing a disk buffer extract), store the data at this time. Be sure to use the File Type of MENU AND DATA.

   - Press **F7** (More)
   - Press **F4** (Mass Store)
   - Press **F4** (Store), < filename >, File Type = MENU AND DATA
   - Press **F6** (EXECUTE)
   - Press **F8** (EXIT)

3. Press **F10** and then **F9** to Exit to the MAIN GROUP of Toolkit.

4. Highlight PC DECODES in Toolkit and then press **ENTER**.

5. This shows the default display for the PC decodes (c:\hptools\analysis\data).

   Change the directory to the one used in the Low Speed Analyzer.

   DATE DIR (**F7**) , (C:\HPTOOLS\STARTUP)

6. PC Decodes uses a specific file format for it's data structure. The data needs to be converted to that format.

   Cursor to the *filename* .M&D to be converted. (CONVERT TO EVENTS, **F4**). Then Next Menu can be ignored since the information will be detected from the MENU portion of the MENU & DATA file, (EXECUTE, **F7**).

7. A new file has been created with the .EVE extension. Place the cursor over this file and press **F5** (EXAMINE DATA) and then **F5** (EXAMINE DATA) again.

8. The data is now displayed on the screen in the PC DECODE format. This format can be either printed to a hard copy device or stored as an ASCII text file for viewing using a text editor.

   SPECIAL FUNCTIONS (**F7**), PRINT EVENTS (**F7**).

   Select **F4** (TO FILE)

   Valid entries here are:

```
filename.txt - goes to the directory specified in step 5
a:\filename.txt - goes to a floppy disk
lpt1 - goes to a parallel port printer
```

7

Remote/Slave Operation

Remote operations are convenient with the Low Speed Internet Advisor. The master PC and slave instruments can communicate, transfer data, menus, applications, test the remote data lines, and provide test results from timers and counters.

You can use the Advisor as a slave to a central site controller (the central site controller doesn't have to be an Advisor, it can be a PC). This lets the Advisor be the eyes for the central site controller. A central site controller can initiate all standard remote operations, as well as control an Advisor operating in the virtual terminal mode.

The Advisor has a "slave" mode of remote. You can make setup choices to configure the Advisor to receive incoming calls from a master remote application.

Remote/Slave Setup

The Remote/Slave setup is in the top level of the Toolkit. This application is a set of programs that lets you remotely control an Advisor, upload and download menu and data files from a remote site, load/store an Advisor file from/to your instrument disk, and analyze data files (in event file format) on your instrument.

Remote/Slave Configuration

You can set up the Advisor for remote operations in the Toolkit. To configure the Slave Setup, perform the following:

1. If you are already at the Low Speed WAN Interface (4959) menu, exit it by pressing **F10** (Exit to Toolkit) and then press **ENTER** (for yes).

2. Press **F4** (Slave Setup). The Slave Setup menu is displayed and shows the following choices:

   - Modem Command Set
   - Hardware Handshaking
   - Baud Rate
   - Com Port

3. **F1** (Com Window) (displayed with modem selections) lets you open a terminal emulator window where you can manually configure modems.

4. **F10** (Exit) lets you leave the Remote Configuration menu.

The Modem Command Set

The choices in the Modem Command Set field are:

- Hayes™
- Other
- Direct Connect

Press **ENTER** to select one of these choices, and then press **ENTER** again to confirm your selection.

If you select 'Hayes' for this field, another field is displayed called Auto Answer. The choices for this field is `On` or `Off`. If you select `On`, your modem will automatically be configured for Auto Answer the next time you turn on your instrument.

Hardware Handshaking

The choices in the Hardware Handshaking field are `On` or `Off`. Press **ENTER** to select one of these choices, and then press **ENTER** again to confirm your selection.

Baud Rate

The choices in the Baud Rate field are:

```
115,200 bps      9,600 bps
57,600 bps       4,800 bps
38,400 bps       2,400 bps
19,200 bps       1,200 bps
14,400 bps
```

Press **ENTER** to select one of these choices, and then press **ENTER** again to confirm your selection.

Com Port

The choices in the Com Port field are:

- COM1
- Modem (COM2)
- Other

Press **ENTER** to select one of these choices, and then press **ENTER** again to confirm your selection.

Remote/Slave Features

You can accept keys from the slave or the master keyboard if your instrument is operating as a slave. If the slave's keyboard is locked by the master, then only master site keys are accepted.

There is a "hot key" sequence that lets you operate a set of command mode remote functions as a slave. When you use the hot key sequence, the master site is automatically put in the command mode remote. To use the hot key sequence, press the left **Alt** key and the right **SHIFT** key simultaneously.

The functions you can perform as a slave are:

- Chat Mode
- Mass Store

Chat Mode

The Chat Window lets a two way dialogue occur between the master site specialist and the remote site technician.

Highlight Chat Window in the Remote Commands and press **ENTER** to start the chat mode between two sites.

Text typed at one site is sent to the other. The Local Chat Window is where text is sent. The Remote Chat Window is where text is received. The master and the slave can both initiate a chat session.

To quit a chat session, press **F10** (Exit Chat).

Mass Store

The Mass Store function lets you transfer files between sites.

Highlight Mass Store in the Remote Commands and press **ENTER** to start the Mass Store function. A DOS Mass Store menu is displayed.

The Mass Store menu is divided into two windows. The top window is labeled Disk drive and displays both local drives and remote drives. The remote drives are listed with an `r` next to the drive letter.

The bottom window is labeled Files and displays the files and directories in the disk drive that is highlighted.

NOTE

Press both the left **Alt** key and the right **SHIFT** key to enter the remote command mode.

External Modem Configuration

The Low Speed Internet Advisor remote operation requires proper modem configuration to work properly in the Hayes emulation mode. The default settings of a modem are usually adequate for proper operation with the Advisor.

The following table shows the specific configuration parameters that are needed for an external modem used with the Advisor:

Table 7-1: Recommended Modem Settings

S2 register	Escape character must be set to '+' or ASCII 43
S3 register	Carriage return character must be set to ASCII 13
S4 register	Line Feed character must be set to ASCII 10
S5 register	Backspace character should be set to ASCII 8
S12 register	Escape code and remote access guard time should be set to 50 (= 1 second)
ATQ0	Modem must have result codes enabled
Flow Control	If a modem supports XON/XOFF or ENQ/ACK flow control, these should be set to *OFF*. This should be checked for error correcting modems (such as MNP5 or V.42)

PCMCIA Modem

If your Internet Advisor has a PCMCIA slot, you can also use a PCMCIA Modem for remote control of the WAN Advisor. To do so, you must configure the WAN Advisor software for COM port 4 and Interrupt 3. The master controller configuration menu is reached by selecting the *Remote Control* tool at the Toolkit top level menu. The slave configuration menu is reached by selecting the *Slave Setup* function key from within the Toolkit menu. Changing one configuration automatically changes the other. The exact settings should be:

```
Com Port          Other
Hardware          Off
Handshaking
Com Base          744 (this is the decimal equivalent
                    of 2E8H for the COM 4 I/O address)
IRQ               3
```

The other settings in the menu depend on the type of modem. However, it is recommended that you leave AutoAnswer ON when modifying the slave setup. This allows the instrument to be remotely captured in an unattended setting.

8

BERT Measurements

The quality of any communication is dependent on the quality of the communications channel. Bit error rate testing (BERT) is a method of assessing and quantifying the quality of a communications channel.

BERT measures the effects of a communications circuit on a digital signal. BERT measurements tell you how often highs are changed to lows and lows to highs in error in a known signal.

A BERT generates pseudorandom bit sequences (PRBS) from a shift register of length L, where the sequence contains 2^L-1 bits. The Low Speed Internet Advisor supports patterns of 63, 511, 2047, and 4095. The Advisor can also send patterns with all 1 bits, alternating 1 and 0 bits, all 0 bits, the "THE QUICK BROWN FOX..." message, or a user-defined message.

The bit error rate (BER), calculated as bit errors divided by bits received, in itself does not give the whole picture. The distribution of errors is also an important consideration. A lightning strike, for example, may cause a large number of errors on the line, but the errors occur grouped together producing a temporary interruption. For this reason, bits are grouped in blocks for measuring block error rate, calculated as block errors divided by blocks received. The Bell system uses 1000 bits per block. CCITT uses block sizes equal to the PRBS pattern length.

Understanding BERT

The Advisor Enhanced BERT includes block and bit error statistics for basic measurements with error analysis and reporting techniques outlined in the CCITT Recommendation G.821.

Information acquired from BERT measurements can be used to determine the performance characteristics on a circuit segment, or end-to-end for the complete circuit. You can also use BERT measurements to make sure a circuit meets performance specifications.

Basic Measurements

Basic measurements include raw error count information accumulated from the line under test along with the calculated percentage of error free seconds and the block and bit error ratios. The information includes:

Time Elapsed	displays the total time the circuit is or was under test for the current measurement.
Errored Seconds and Error Free Seconds	displays the number of seconds that contained bit errors and the percentage of the total time without errored seconds.
Block Count	displays the total number of blocks received for the current measurement.
Block Errors and Block Error Ratio	displays the number of blocks with errors and the ratio of errored blocks to total blocks received in the current measurement.
Bit Count	displays the total number of bits received in the current measurement.
Bit Errors and Bit Error Ratio	displays the number of bits in error and the ratio of errored bits to total bits received in the current measurement.

NOTE Measurement Notation Ratios in the Basic Measurements window are displayed in exponential notation. Therefore, a value of 1×10^{-6} is displayed as 1.0e-6.

G.821 Analysis

The CCITT Recommendation G.821 outlines performance objectives for digital voice and data signals on bidirectional 64 Kbps circuit-switched connections used for ISDN. The specifications outline performance goals in terms of performance parameters based on the bit error ratio (BER) for a threshold period when measured over a period of time that is much longer than the assessment period.

The performance objectives were designed to:

- give users of digital services an indication of expected error performance in an operational network
- serve as a working document for the definition of performance standards for equipment manufacturers and users

The G.821 defines the following terms:

Available Time	is the elapsed time less the unavailable time, in seconds.
Unavailable Time	is the amount of time the circuit is not able to reliably transmit data, defined as beginning with ten consecutive severely errored seconds and ends at the beginning of a period of ten consecutive seconds that are not classified as severely errored seconds.
Severely Errored Seconds	are the number of one second intervals where the bit error ratio is worse than 1×10^{-3}.
Errored Seconds	are the number of seconds with at least one bit error.
Degraded Minutes	are the number of one minute intervals where the bit error ratio is worse than 1×10^{-6}.

Different BERT Measurements

BERT measurements can be run:

- for end-to-end connections over a network using two bit error rate test sets
- using a loopback

End-to-end Connections

An end-to-end test, also referred to as a point-to-point test, involves the use of two BERT instruments to measure a circuit. A test is started on each of the instruments at both ends of the circuit. The results are noted and used for comparison. Each instrument transmits to the other, and the errors noted on the circuit are recorded by the instruments.

End-to-end tests simulate the results of one device communicating with another.

Loopback Testing

In a loopback test, one BERT instrument transmits a BERT message. The message is then echoed back to the original instrument which then records the results of the test.

Running Enhanced BERT

The Enhanced BERT application can be found in the Toolkit menu.

The Advisor lets you select the parameters for controlling BERT measurements. The values selected and displayed in the Enhanced BERT windows are the parameters used when you start a BERT measurement.

To start an Enhanced BERT measurement:

1. Connect the Advisor for the type of measurement you want to make and then turn the Advisor on.

2. From the Toolkit top level menu, select `Enhanced BERT` and press **ENTER**.

You can stop the Enhanced BERT and return to the Toolkit top level menu by pressing **F10** (Exit).

You can also start a BERT measurement and then exit the BERT application to use your system for other functions. See the section "Exit with a Measurement Running" for more information on this function.

BERT Setup

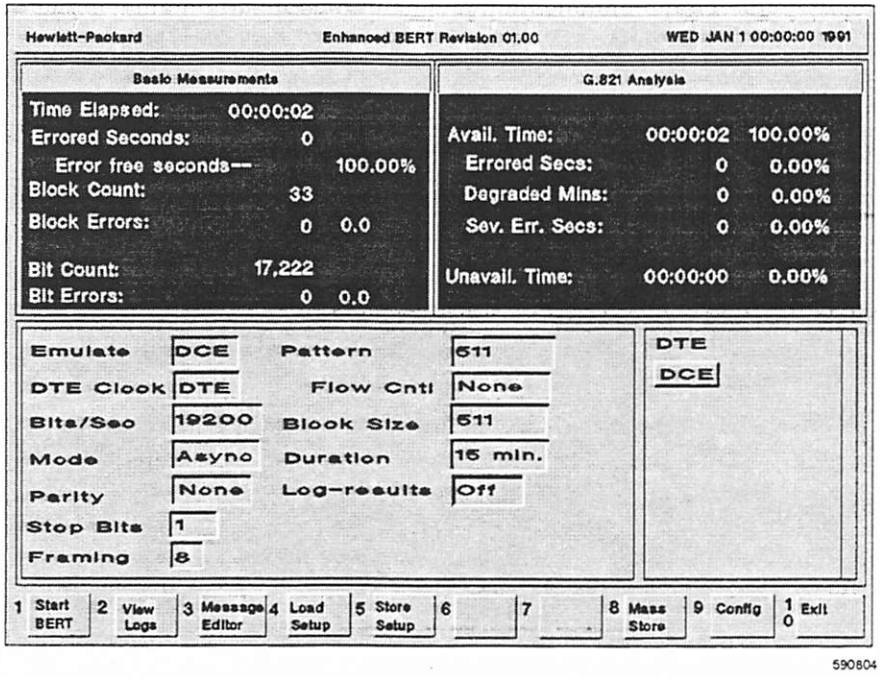

Figure 8-1: The Enhanced BERT Interface

emulation	DTE, DCE
line speed	from 50 to 64000 bits per second
analysis	bit/block statistics, G.821 performance analysis
mode	synchronous, asynchronous, isochronous
block size	511, 1000, 2047
patterns	PRBS of 63, 511, 2047, and 4095, all 1s, alternating 1s and 0s, all 0s, "THE QUICK BROWN FOX..." message, user-defined messages up to 1024 characters in length

framing	set a type of framing bit - none, 8, 7, 6, 5
parity	none, odd, even, mark, space
error injection	single errors, a burst of ten errors, at intervals of one every 10^2, 10^4, 10^5, or 10^7 bits
flow control	Control Leads, XON/XOFF, none

Setting the Line Characteristics

The line characteristics determine the physical layer interface. Select the parameters that match the circuit being tested.

1. From the Toolkit, select `Enhanced BERT` and press **ENTER**.

2. Select the appropriate line characteristics for your test from the fields in the left column of the parameters window. Use the ↑ and ↓ keys to position the cursor in the field to change.

3. Press the **ENTER** key to select the list box panel on the right side of the parameters window.

4. Use the ↑ and ↓ keys to highlight the desired value, and press **ENTER** to select it.

5. Repeat steps 2 through 4, as needed, to set each of the line characteristics.

Emulate

Select an emulation type in this field. You can select an emulation type of `DTE` or `DCE`.

DTE clock

Select a clock source in this field. You can select a clock source of `DTE` or `DCE`.

Bits/Sec

Select a transmission rate in this field. You can select from the following:

All Framing Types				Synchronous Only
50	200	2000	7200	
75	300	2400	9600	38400
110	600	3200	12000	48000
134.5	1200	3600	14000	56000
150	1800	4800	19200	64000

Mode

Select the mode in this field. You can select `Sync` (synchronous), `Async` (asynchronous), or `Isoc` (isochronous)

Parity

Select a parity bit for asynchronous communications in this field. For character sizes less than eight bits, you can select a parity of `None`, `Odd`, `Even`, `Mark`, or `Space`.

Mark and space parity are not available for eight bit character tests.

Stop Bits

Select the number of stop bits sent with each character transmitted in this field. You can select stop bit durations of `1`, `1.5`, or `2`.

Framing

Select the type of framing in this field. You can select `none`, `8`, `7`, `6`, or `5`.

NOTE

Field Display
The Parity, Stop Bits, and Char Size fields only appear in the parameter window when asynchronous or isochronous framing are selected. The Char Size field does not appear when you select a user-defined message pattern since the character size is determined by the data code selected in the Message Editor.

Setting the BERT Options

The BERT options determine the characteristics for the measurement. Select the parameters that match the circuit being tested.

1. From the Toolkit menu, select `Enhanced BERT` and press **ENTER**.

2. Select the appropriate BERT options for your test from the fields in the upper right column of the parameters window. Use the ↑ and ↓, ←, and → keys to position the cursor in the field to change.

3. Press the **ENTER** key to select the list box panel on the right side of the parameters window.

4. Use the ↑ and ↓ keys to highlight the desired value, and press **ENTER** to select it.

5. Repeat steps 2 through 4, as needed, to set each of the line characteristics.

Pattern

Select a BERT pattern in this field. You can select patterns of:

63	to send frames with the 63 pseudorandom bit sequence.
511	to send frames with the 511 pseudorandom bit sequence.
2047	to send frames with the 2047 pseudorandom bit sequence.
4095	to send frames with the 4095 pseudorandom bit sequence.

FOX	to send frames containing the character test string "THE QUICK BROWN FOX JUMPED OVER THE LAZY DOG."
All 1's '	to send frames of all 1 bits.
101010...	to send an alternating pattern of 1 and 0 bits.
All 0's	to send frames of all 0 bits.
USER	to send user-defined messages.

Block Size

Select the BERT block size in this field. You can select block sizes of `511`, `1000`, or `2047`.

Duration

Select the test duration in this field. You can select test durations of:

1e5 bits	to select a 100,000 bit test.
1e6 bits	to select a 1,000,000 bit test.
1e7 bits	to select a 10,000,000 bit test.
1e8 bits	to select a 100,000,000 bit test.
1e9 bits	to select a 1,000,000,000 bit test.
1 min.	to test for 1 minute.
5 min.	to test for 5 minutes.
10 min.	to test for 10 minutes.
15 min.	to test for 15 minutes.
1 hour	to test for 1 hour.
4 hours	to test for 4 hours.
12 hours	to test for 12 hours.
24 hours	to test for 24 hours.
48 hours	to test for 48 hours.

Select Result Logging

Result logging sets a destination for the results of the BERT measurement to be saved (logged). Select the parameters that match the circuit being tested.

1. From the Toolkit top level menu, select `Enhanced BERT` and press **ENTER**.

2. Select the appropriate logging options for your test from the fields in the lower right column of the parameters window.

   Use the ↑, ↓, ←, and → keys to position the cursor in the field to change.

3. Press the **ENTER** key to select the list box panel on the right side of the parameters window.

4. Use the ↑ and ↓ keys to highlight the desired value, and press **ENTER** to select it.

5. Repeat steps 2 through 4, as needed, to set each of the line characteristics.

Log Results

Select a destination for the results in this field. You can select:

Off	when you do not want to log the results of the measurement.
Disk	when you want to save the results to a disk file. Also select a file name to receive the measurement results.
Printer	when you want to print out the results as the test proceeds.

Interval

Select a logging interval in this field. You can select `1 Min.`, `5 Min.`, `15 Min.`, `30 Min.`, or `1 Hour`.

This field only appears if 'Log-results' is not *Off*.

Log File

Select a file to receive data when you have selected 'Log-results: Disk.' You can enter a file name or press **ENTER** to activate the 'browse' window. This field only appears if you have selected 'Log-results: Disk.'

Saving a BERT Configuration

You can save the current parameter selections in a file for later use. The file includes the responses to each of the fields on the Enhanced BERT parameter window as well as any user-defined message string.

1. Press **F5** (Store) in the Enhanced BERT main window.
2. Enter a valid DOS file name in the file name field, or press **ENTER** to open the Mass Store window where you can select a file name.
3. Select the (OK) softkey.

Loading a BERT Configuration

You can retrieve a previously saved BERT configuration.

1. Press **F4** (Load) in the Enhanced BERT main window.
2. Enter the file name of a previously saved configuration, or press **ENTER** to open the Mass Store window where you can select the file name of a previously saved configuration.
3. Select the (OK) softkey to retrieve the contents of the file.

The BERT parameters, and the associated user-defined message, will be loaded into the Enhanced BERT application.

The Message Editor

The Message Editor lets you create your own message to be used in a BERT measurement. Messages can be entered and changed in the Message Editor. Messages can be saved using the Enhanced BERT main window (Store) softkey, and previously saved messages are loaded with the interface parameters when a BERT menu file (.BMF) is loaded.

The longest message you can enter is 1024 characters. The data code for the message can be selected by using the (Data Code) softkey. The Message Editor uses the following control keys:

Key	Response
↑	move the cursor up one line in a message
↓	move the cursor down one line in a message
←	move the cursor left one position in the message
→	move the cursor right one position in the message
HOME	move the cursor to the beginning of the current line
END	move the cursor to the end of the current line
SHIFT + HOME	move the cursor to the beginning of the message
SHIFT + END	move the cursor to the end of the message
INS	toggle the insert/overwrite input mode; insert mode (the default) is indicated by a block cursor, the overwrite mode is indicated by an underline cursor.
← **(Backspace)**	delete of the character immediately to the left of the cursor
DEL	delete the character at the cursor position
F2 (Clear Message)	to clear a previously entered message

Key	Response
F3 (Data Code)	you can select the appropriate data code for the user-defined message
F4 (Hex)	to select hexadecimal input and display mode
F5 (Text)	to select text input and display mode
F10 (Exit)	to return to the Advisor Enhanced BERT window

The Message Editor Window

The Message Editor window contains 13 full length (74 character) rows and an additional 62-character row for a total message size of 1024 characters. A diamond character marks the end of the message. The status window displays information on the current cursor position (by byte offset into the message, and by row and column number in the display). When the cursor is positioned under a character in the message, the value of the character is also displayed in the status window in character, hexadecimal, and binary formats.

Start the Message Editor

The message editor is started by pressing **F3** (Message Editor) in the Enhanced BERT main window.

Select a Data Code

You can enter message strings using ASCII or EBCDIC characters as text or as their hexadecimal values.

1. Press **F3** (Data Code) to activate the data code window.
2. Press the **ENTER** key to select the list box panel on the right side of the parameters window.
3. Use the ↑ and ↓ keys to highlight the desired value and press **ENTER** to select it.

4. Press **F10** (OK) softkey to accept the value or press **F1** (Cancel) to retain the current setting.

5. Select data codes of `ASCII`, `ASCII 7`, `ASCII 8`, `EBCDIC`, `HEX-8`, `HEX-7`, `HEX-6`, or `HEX-5`.

Enter a Character String

You can enter ASCII and EBCDIC characters in text mode.

1. Position the cursor where you want entry to begin.

2. Press **F5** (Text) to select the text entry mode.

3. Enter the text.

Enter Non-Text Characters

You can enter non-text (hexadecimal) characters into the message at any location.

1. Position the cursor at the location where the input should take place.

2. Use **F4** (Hex) to switch to hexadecimal input mode.

3. Enter the two hexadecimal characters that make up the value of the message character (octet).

Any data code can be entered in hexadecimal format. Data codes with less than eight bits are entered as eight bit hexadecimal values but are masked to store only the significant bits for the selected data code character size.

NOTE

Display Format
Hexadecimal characters are displayed in double character-compressed format.

Canceling Message Changes

If you're in the process of changing a message and would like to restore the original message, use **F1** (Cancel) to restore the original message.

Exiting the Message Editor

Press **F10** (Exit) to exit the message editor and return to the Enhanced BERT main window.

Testing a Circuit

After you have selected the parameters for a measurement and have properly connected the lines you can start BERT. For more information on selecting an interface, see chapter 4.

When you start a BERT measurement the interface is initialized and the leads are brought to the appropriate condition. For the RS-449 interface, the RS and DS leads are asserted. For all other cases, the RTS and DTR leads are asserted.

NOTE

Synchronization
The BERT receiver must be synchronized to the transmitter for the receiver to properly evaluate the signal on the line. The BERT transmitter must have the following characteristics:

Unframed patterns	The speed of the clock generating the transmitted pattern must be within 1% of the clock generating the receiver pattern.
Framed patterns	Both clocks must be within 5% of each other.

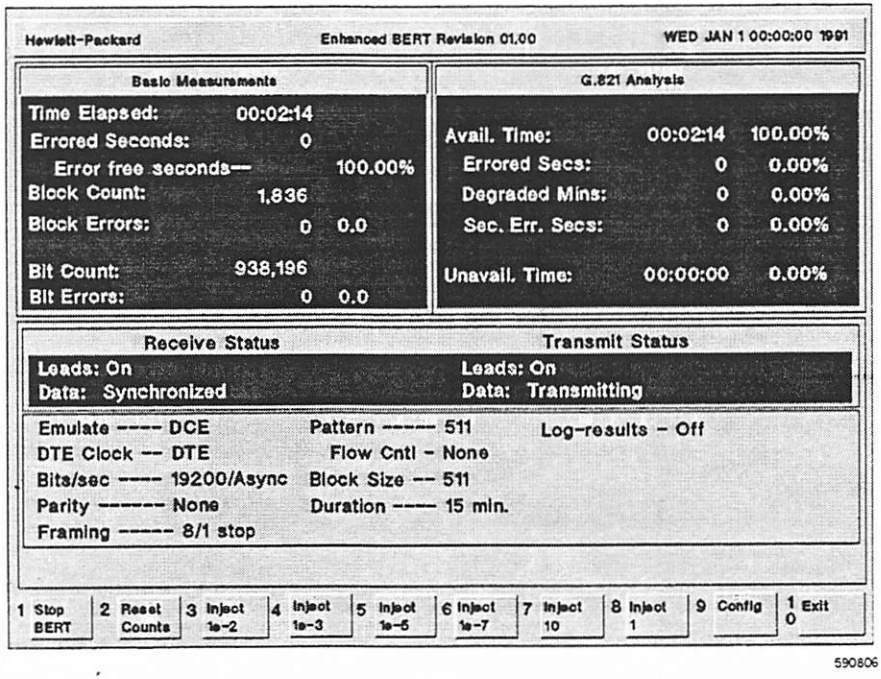

Figure 8-2: The BERT Measurement Window

Starting/Stopping a Measurement

1. Select the appropriate interface, measurement and logging options.

2. Press **F1** (Start BERT) to start the measurement.

   The BERT runtime window is displayed. The middle pane shows the line transmit and receive status. The lower pane shows the selected measurement options.

3. Press **F1** (Stop BERT) to STOP the measurement and return to the BERT main window. If you selected result logging to disk, the results up to the point where you stop the logging are saved in the log file.

Injecting Errors into a Circuit

You can evaluate the circuit by forcing errors into the data stream. The Advisor lets you select repetitive injection of errors at a known rate or injection of a fixed number of errors. You can use the softkeys on the BERT run window to select the desired option.

1. Start the Enhanced BERT.

2. Select the appropriate interface and BERT parameters.

3. Start a test with **F1** (Start BERT).

4. Select one of the error injection options for the run window softkeys.

   Use the run window error injection softkeys:

F3 (Inject 1e-2)	to start the injection of an errored bit every 100th bit sent
F4 (Inject 1e-4)	to start the injection of an errored bit every 10,000th bit sent
F5 (Inject 1e-5)	to start the injection of an errored bit every 100,000th bit sent
F6 (Inject 1e-7)	to start the injection of an errored bit every 10,000,000th bit sent
F7 (Inject 10)	to inject 10 errored bits into the data stream, one in each of 10 successive characters
F8 (Inject 1)	to inject an errored bit into the data stream.

5. Press **F9** (Stop Inject) softkey when you want to stop injecting errors.

NOTE

Error Softkey Usage
When errors are being injected at a selected rate, **F7** (Inject 10) and **F8** (Inject 1) are disabled, and **F7** (Stop Inject) is enabled.

Resetting Counters

1. Press **F2** (Reset Counters) to zero all of the BERT accumulators and to re-initialize the clock.

   The measurement will start running again and collect statistics. Resetting the counters has the same effect as restarting a measurement by pressing **F1** (Stop BERT) followed by **F1** (Start BERT) at the BERT main window.

Exit with a Measurement Running

Enhanced BERT lets you start a BERT measurement and then exit the BERT application to use your system for other functions.

1. Configure the measurement as needed.

2. Press **F1** (Start BERT) to start the measurement.

3. When the measurement has started, press **F10** (Exit) on the BERT test window to return to the BERT main window.

4. Press **F10** (Exit) on the BERT main window to return to the Toolkit.

5. Press the Toolkit (Exit) softkey (**F10**) to exit to MS-DOS or run another application.

NOTE

No Exit with Logging Enabled
You cannot exit a running measurement when you have selected log to printer or log to disk.

If you start another Advisor application while you are running a BERT measurement, the measurement will be stopped and the results will be lost. You can, however, leave the Toolkit and run other (DOS, etc) applications.

Restarting BERT with a Measurement Running

When you want to display the results of a BERT measurement left running, you can restart the BERT measurement. When you restart the application, the measurement is immediately displayed.

Looking at the Results

You can evaluate test data after you have completed a BERT measurement. Information can be viewed in three different formats:

- Single Entries
- Basic Measurements
- G.821 Analysis

Viewing a Log File

You can look at a log file that has been previously saved to a disk. To load a log file:

1. Press **F2** (View Logs) in the Enhanced BERT main window.
2. Enter a log file name or press **ENTER** to open the Mass Store window where you can select a file name.
3. Select (OK) to retrieve the file or (Exit) to cancel the request.

After the contents of the log file have been retrieved, you can use the softkeys to move around the log file.

You can also select a different log file by selecting (Load File).

Summary Format

The summary format shows you information on basic measurements and G.821 analysis for all entries in the log file.

Find individual entries in the summary log file by using the following softkeys:

- The (Goto Entry) softkey opens a box where you can enter the number of the entry you want to highlight.

- The **PgUp, PgDn,** and arrow keys move you through the file.
- The **HOME** key displays the first entry in the log file.
- The **END** key displays the last entry in the log file.

You can select an entry by highlighting it and selecting the (Exit) softkey. This shows you the individual information for the entry you selected.

Highlighted Data - The CCITT Recommendation G.821 defines performance objectives for different grades of circuitry. The BERT G.821 summary display highlights degraded minutes, errored seconds, and severely errored seconds when these values are above the recommended limits.

Refer to the CCITT Recommendation G.821 for more details on error performance objectives, their calculations, and allocations.

Single Entry Format

The Single Entry display shows you detailed information for a single entry from the log file. The entry number is shown in the bottom right corner of the display.

You can look at different entries in the log file by using the following softkeys:

- The (Goto Entry) softkey opens a box where you can enter the number of the entry you want to display.
- (Prev Entry) displays the prior entry in the log file.
- (Next Entry) displays the next entry in the log file.

Go to the Summary display by pressing **F2** (Summary Display).

Select a different log file by selecting (Load File).

9

Capturing High Speed Data

You can use a provided high speed capture application for monitoring and capturing data at speeds above 64 Kbps. However, simulating above 64 Kbps is not supported in the Low Speed Internet Advisor.

To load and use the high speed application, use the following procedure. More information on the selections that can be made for the high speed application is given in "High Speed Capture Selections" following this procedure.

1. If you are not already at the Low Speed WAN Interface (4959) menu, select `Low Speed Analyzer` in the Toolkit by pressing **ENTER**, and then select `Protocol Analyzer` by pressing **ENTER**. This brings up the Low Speed WAN Interface (4959) menu.

2. Press **F7** (MORE) and then **F5** (Load Appl).

3. Press ↓ until you highlight `HS_Capture`. Select (Execute).

4. Select (Set Up) and set the Advisor to match the line parameters and display format you want to use. When you make a bits/sec selection, you can choose from 72k bits/second up to 256k bits/second. Press **F7** (MORE) if you need more softkey selections.

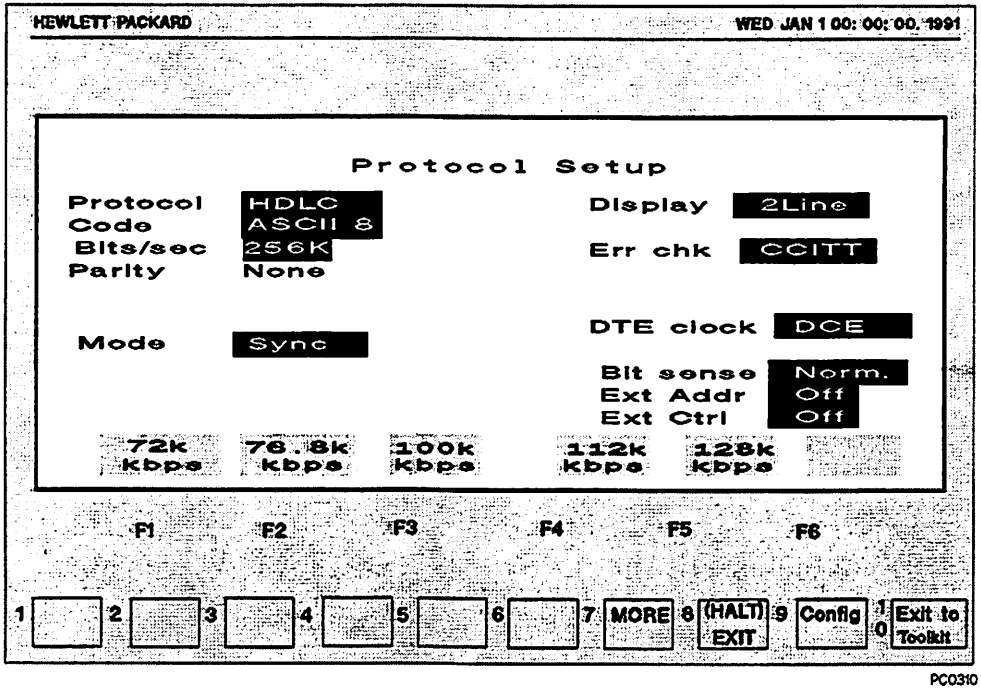

Figure 9-1: Setup Menu with High Speed Capture

5. Press **F8** (Halt/Exit) to go back to the Low Speed WAN Interface (4959) menu with High Speed capture loaded. The (Run Menu) softkey is replaced with (HS Capt).

6. Press **F5** (HS Capt) to start the application.

NOTE

If you try to run the application using the internal RS-232 interface, the Low Speed Advisor will not let you capture data. A warning screen tells you that RS-232 is not valid for High Speed Capture.

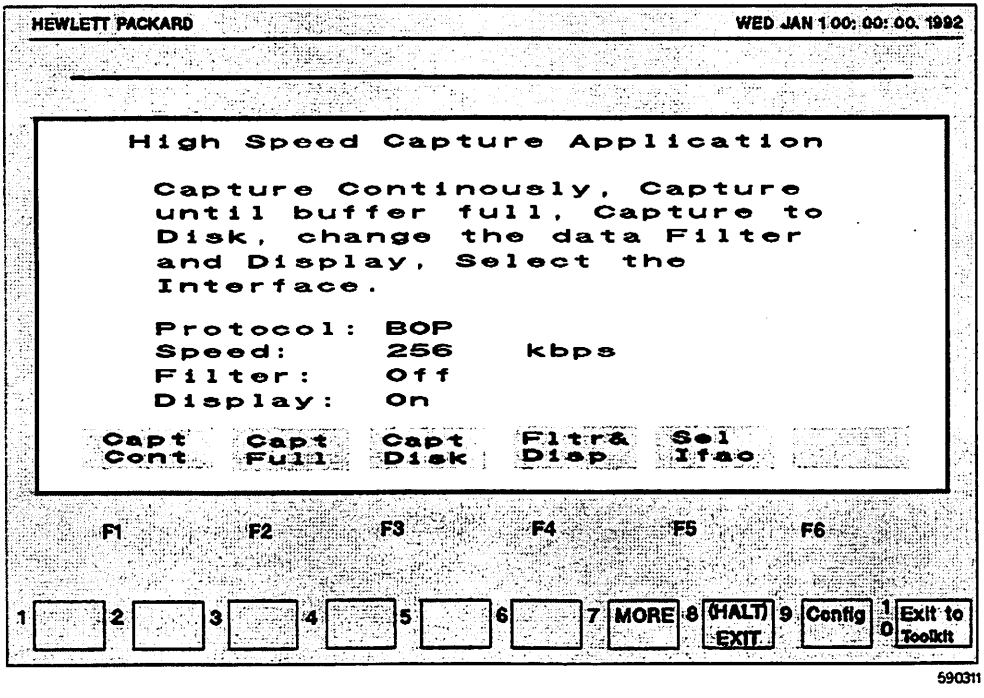

Figure 9-2: Selection Screen for High Speed Capture

High Speed Capture Selections

Selections that are available for capturing high speed data are selected with the following softkeys:

Capt Cont	circular store 768 Kbytes of data to the buffer
Capt Full	capture and fill the buffer. The Advisor stops capturing data when the buffer is full
Capt Disk	capture data and store continuously to the circular hard disk buffer. Specify the disk buffer size by following the steps in the section titled Sizing the Disk Buffer. This mode only operates with the runtime display off
Fltr & Disp	enable or disable all data filters and the runtime display. Effected data filters are lead changes, timing information, and errors. Data can be captured on DCE Only, DTE Only, DCE & DTE, or Errs Only
Sel Ifac	select one of three internal or an external interface

You must set the bit rate if you are monitoring asynchronous or NRZI encoded data.

NOTE When monitoring in High Speed Capture, triggers are inactive and the Monitor menu is disabled.

Sizing the Disk Buffer

The Low Speed Internet Advisor comes with a default disk buffer size of 5 Mbyte. You can change the disk buffer size to match your testing needs.

To change the disk buffer size you must delete the current disk buffer and create a new one. Before deleting the current disk buffer, you can save the contents of the

current disk buffer. Refer to the section titled "Saving Data Captured to the Hard Disk During Run-Time" in chapter 4.

To change the disk buffer size:

1. Press **F9** (Config), from the High Speed Capture Application menu.

2. Press **F8** (Dsk Buf Manager).

3. Press **F4** (Delete Buffer). You must delete the current disk buffer prior to creating the new one.

4. Enter the disk drive and the disk buffer size. The disk buffer size will be adjusted slightly due to system requirements.

5. Press **F1** (Create Buffer).

6. Press **F10** twice to return to the High Speed Capture Application menu.

To use the new disk buffer, create a Monitor program that contains 'start disk' in the first program block. See "Capturing to Disk While Running at 64Kbps or Less" in chapter 4 for an example program.

High Speed Capture Limits

- Async only uses eight-bit data codes, no parity, no error check, LSB first.
- You cannot store directly to floppy disk while capturing data. When you store menus to disk, the high speed setup cannot be stored.
- Disregard bits/second in the Summary screen (runtime or examine data).
- High speeds present some utilization problems. If you encounter `Buffer Overflow` error message, turn off the display.
- If you encounter `Receiver Overflow` turn off the timing information.
- Time stamps are placed only on start flags. Measuring other characters returns unpredictable results.

10

Terminal Emulators

Intelligent devices must often be configured with an asynchronous terminal. In these cases the terminal emulator is used to establish a connection and perform a test on that connection. For example, some statistical multiplexers must be configured through an asynchronous terminal connected to them.

Simulate menus can be run from the VT100 Terminal Emulator to troubleshoot a problem. In some cases, if the DTR/DSR lines drop, the connection is lost. In these cases the terminal emulator can execute the test by establishing a connection and then keeping the DTR/DSR lines up while you run a Simulate menu.

NOTE

Not Through the Com Port

The VT100 terminal emulator supplied with the Low Speed Internet Advisor runs through the selected interface, not through the Comm port. If you want to run through the Com port, load a PC based terminal emulator program such as ProComm or another of your choice.

Using the ProComm Terminal Emulator

A PC based terminal emulator called ProComm has been included in the Toolkit.

To start Procomm, highlight Terminal Emulator in the Toolkit top level menu and press enter. The ProComm program is displayed. Press enter again to actually start the terminal emulator. If you need help, press **ALT F10** to access the ProComm help files.

Press **ALT X** to quit ProComm. The display will ask `exit to DOS?` Enter `yes` to return to the Toolkit display.

Using the VT100 Emulator

The VT100 Emulator has four main functions:

- Setup - Set communication parameters for communication for terminal.
- Setup=Sim. - Copy parameters from simulate setup to terminal.
- Simulate - Run simulatemenu and return, keeping leads up.
- Execute - Enter terminal mode.

When operating in the terminal mode, each character is transmitted immediately after it is typed.

NOTE

Lost Connection
In some cases, if the DTR/DSR lines drop, the connection is lost. To avoid this problem, these lines are maintained while going between terminal mode and running a simulate menu.

The VT100 Terminal Emulator never acts as a host. This means ENQ/ACK is initiated by the host computer. The computer is set up to send a specified number of characters (e.g., 80) followed by an ENQ character (usually 05H). When the terminal has processed all received characters and is ready for more, it sends an ACK character (usually 06H). To select this type of handshake choose ENQ/ACK in the Terminal Setup menu.

In the terminal mode of operation, you can manually control the data flow using the Xon and Xoff characters. To stop receiving data, transmit an Xoff signal (usually press **CTRL + S**). To restart the flow of data transmit an Xon signal (usually press **CTRL + Q**). This method of flow control can be used with either ENQ/ACK or NONE handshaking.

The software handshake controls the flow of data between devices so overflows do not occur. Although very few dumb terminals are designed to handle software handshaking, the terminal emulator application supports ENQ/ACK (for HP Computers).

Loading the VT100 Emulator

1. If you are not already at the Low Speed WAN Interface (4959) menu, select `Low Speed Analyzer` in the Toolkit by pressing **ENTER**, and then select `Protocol Analyzer` by pressing **ENTER**. This brings up the Low Speed WAN Interface (4959) menu.

2. Press **F9** (Config) and change the Current Mass Store directory to `C:\hptools\utildisk`.

3. Press **F10** (Exit Config).

4. Press **F5** (Load Appl) and move the cursor to highlight the VT100 application.

5. Press **F6** (Execute).

6. Press **F7** (More) and then select (VT100) to enter the VT100 top level menu.

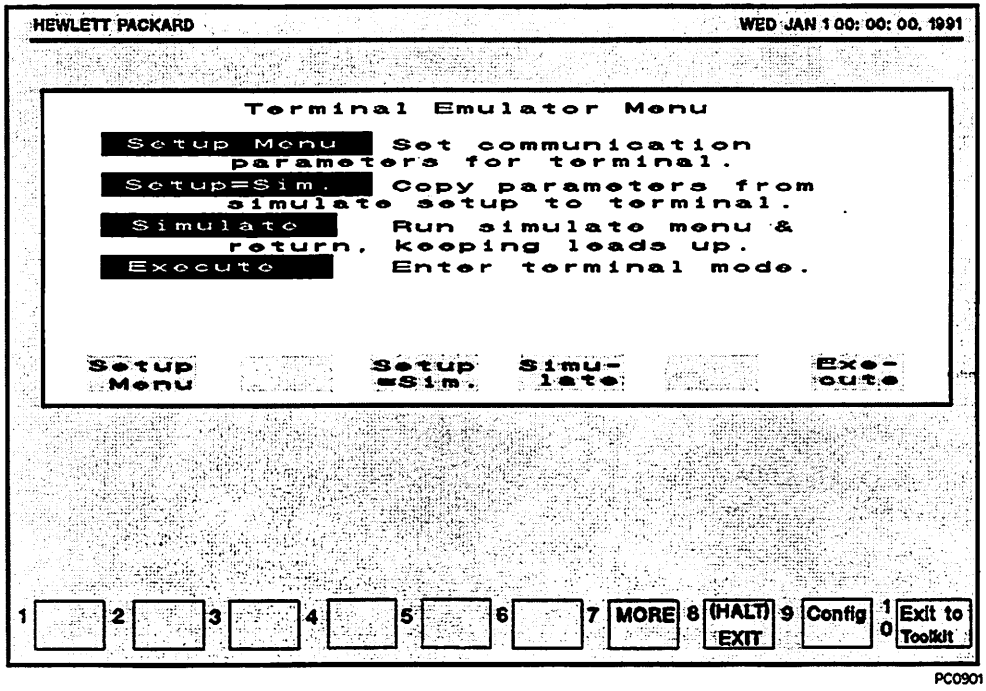

Figure 10-1: Terminal Emulator Menu

Setting Up the VT100 Emulator

The Asynchronous Terminal Emulator lets you use the Advisor as an asynchronous terminal. You must configure the Setup menu to correspond with the host.

From the VT100 top level menu:

1. Select (Setup Menu) to access the TerminalSetup menu.

2. Select the `Data Code:` (ASCII 7) or (ASCII 8).

3. Press ↓ and select the `Parity`: (None), (Odd), (Even), (Space), and (Mark) or (Ignore).

4. Press ↓ and select the data rate in `Bits/sec`: (50) ... (19200).

5. Press ↓ and select the emulation `Mode`: (DTE) or (DCE).

6. Press ↓ and select `Handshake`: (None) or (Enq/Ack).

7. Press ↓ and turn local `Echo` (On) or (Off). If local echo or remote echo (echo from main office computer) is in effect, characters appear on the display as they are typed.

8. Press ↓ and turn `Bell` (On) or (Off).

9. Press → and turn `Display Functions` (On) or (Off).

10. Press ↓ and turn `Auto LF after CR` (On) or (Off).

11. Select (Exit) to return to the VT-100 top level menu.

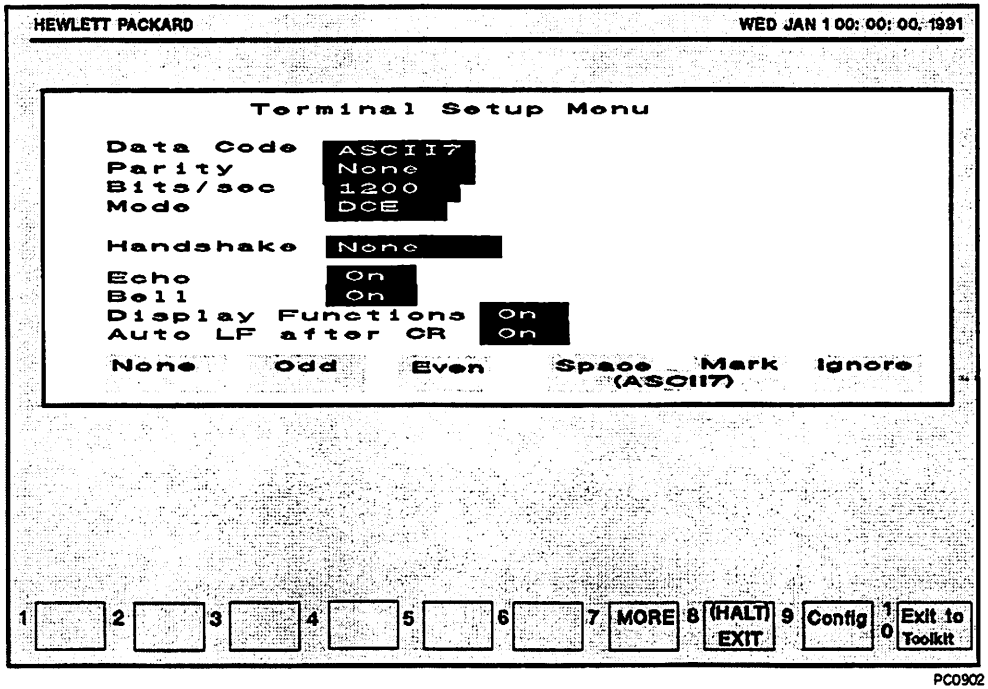

Figure 10-2: Terminal Setup Menu

You can set up the VT100 Terminal Emulator to match a previously loaded simulate menu. With Setup=Simulate, you can transfer all setup parameters that were used when you developed a Simulate menu. This automatically makes all settings correspond to the loaded Simulate menu.

Instead of using the Setup menu:

1. Select (Setup=Sim.) totransfer the parameters from the Monitor/Simulate Setup and Simulate menus to the Terminal Emulator menu. The following terminal setup parameters are overwritten:

    a. Parity of Monitor/Simulate Setup menu
    b. Bits/sec of Monitor/Simulate Setup menu
    c. Mode, DCE or DTE (first line of Simulate menu)

2. Select (Simulate). The Simulate menu is executed.

3. To stop running the Simulate menu press **F8** (EXIT) and return to the Terminal Emulator menu.

Running the VT100 Emulator

1. From the VT100 top level menu, select (Execute) to go to the terminal mode. The last terminal session appears on the display.

2. If no previous terminal emulator sessions have been initiated, the display is cleared and the cursor is placed in row 1, column 1 (top row, far left column). The current row and column are displayed in the bottom left portion of the screen.

3. Press **F8** (EXIT) in the terminal mode to get back to the VT100 top level menu.

As an asynchronous terminal, the Advisor receives one or more stop bits and transmits two stop bits, making it compatible with all asynchronous devices. When using the application in DTE mode, the Data Terminal Ready (DTR) and the Request To Send (RTS) leads are set ON to ensure communications, however, the terminal emulator application will transmit regardless of the state of Data Set Ready (DSR), Clear To Send (CTS), and Carrier Detect (CD) from the other device. When operating in DCE mode, the DSR, CTS, and CD leads are set ON but the terminal emulator will transmit regardless of the state of DTR and RTS from the other device. In the terminal mode the following terminal softkeys appear.

Cap Lock	All keys are displayed in upper case. An asterisk is displayed in the softkey to indicate that caps lock is on.
Clear Screen	Press to clear both top and bottom half of the screen.
Display Top	Displays the top half of the display buffer, rows 1 through 13. The cursor location symbol is at the top of the line.
Display Bottom	Displays the bottom half of the display buffer, rows 12 through 24. The cursor location symbol is at the bottom of the line.

Hex Entry	Lets you enter hexadecimal characters through the keyboard. An asterisk is displayed in the softkey when hex entry is on.
Break	Press this softkey to signal an interrupt of computer operations. A break is sent for 55 milliseconds. The shortest break possible is 6 milliseconds.

Using the Display Buffer

The VT100 display buffer contains information for 128 columns and 24 rows, however, only 32 columns and 13 rows are displayed at one time. The Advisor's screen is 32 columns by 13 rows. The display buffer contains information for up to two complete screens, or 24 rows with one row of overlap between screens and 128 columns. This effectively gives you an active display area of two screens vertically and four horizontally.

The current cursor row and column location is displayed at the bottom of the screen, below the softkeys.

- To move the cursor forward in the active screen, press **SHIFT** + →. When the cursor reaches column 128 it will immediately wrap to column 113 of the next row.
- To move the cursor backward, on the same line, press ←. The cursor will not wrap.
- To move the cursor up one row in the same column, press **SHIFT** + ↑. When the cursor reaches the top row in the bottom screen, it will move to the bottom row of the top screen.
- To move the cursor down one row and to column 1, press ↓.

NOTE

Scrolling
You must use commands that support scrolling to move the cursor from one screen to another. If scrolling commands are not used, the cursor remains at either the top or the bottom of the current screen.

Working with Control Characters

Control characters can be sent by simultaneously holding down **CTRL** and pressing the desired character key. The terminal ignores most control characters and does not display them. Control characters the terminal does recognize are:

Table 10-1: Active Control Characters

ASCII	Hex	Response	Keystroke
ENQ	0_5	Transmit ACK	CTRL + E
BELL	0_7	Beep	CTRL + G
BS	0_8	Backspace	CTRL + H
HT	0_9	Tab one space	CTRL + I
LF	0_A	Line feed	CTRL + J
CR	0_D	Carriage return	CTRL + M

Using the Escape Codes

Special escape codes are used to perform the VT100 terminal operations. The Advisor VT100 Terminal Emulator can send and receive the escape sequences.

The convention <ESC> is used to show an escape character. Refer to the operating manual of your host computer for entering the escape character. To enter an escape code on the Advisor, press **CTRL + [**. The square open bracket symbol ([ ) is a literal entry to introduce the following parameter (p1).

Code	Definition
<ESC>[p1 A	Moves the cursor up by p1 lines in the same column. The screen does not scroll.
<ESC>[p1 B	Moves the cursor down by p1 lines in the same column. The screen does not scroll.
<ESC>[p1 C	Moves the cursor right by p1 spaces. If the cursor is at the right edge of the screen, it does not move.
<ESC>[p1 D	Moves the cursor left by p1 spaces. If the cursor is at the left edge of the screen, it does not move.
<ESC>[p1;p2 H	Moves the cursor to row p1 and column p2. Row 1 and column 1 are the top left corner of the screen. The cursor cannot be moved beyond row 24 or column 80.
<ESC>[p1 J	Blanks the screen according to p1 when: p1 = 0 from cursor position to bottom of screen p1 = 1 from start of screen to cursor position p1 = 2 entire screen
<ESC>[p1 K	Blanks the line according to p1 when: p1 = 0 from cursor position to end of line p1 = 1 from start of line to cursor position p1 = 2 entire line
<ESC>[p1;p2 f	Same as <ESC>[p1;p2 H
<ESC>[p1;...;pn m	Set graphic parameters according to: p = 0 all attributes off p = 1 bold p = 4 underline p = 5 blink p = 7 inverse video
<ESC>7	Saves cursor position
<ESC>8	Restores parameters saved by <ESC>7

<ESC>D	Moves the cursor down 1 line. If the cursor is at the last line, the screen scrolls and displays subsequent buffer screens. If the current screen is the last (fourth) buffer screen, the cursor does not move.
<ESC>E	Moves the cursor to the left margin, down 1 line
<ESC>M	Moves the cursor up 1 line. If the current buffer screen is not the first buffer screen, the display screen scrolls. If the current display screen is the first buffer screen, the cursor does not move.
<ESC>c	Resets to saved/power-on state and self test

For example:

```
<ESC>[0;1;4;5;7 m
```

will turn all graphic parameters on.

11

Programming Reference

The Monitor and Simulate menus let you configure the Low Speed Internet Advisor to look for specific events, capture user defined data, and emulate data communications equipment. Softkeys provide all commands and conditions that you will need to develop these programs. As each softkey is selected new softkey selections appear that lead you through your program. For example, if you select (Start), new softkey selections appear that allow you to tell the Advisor what to start. In this case, the Display, the Disk, or a Timer.

Always set up the Advisor with the proper parameters before programming. If the setup is incorrect the program may not work. For example, if the data code being monitored is EBCDIC, but your setup is ASCII, the data strings intended in these menus will be incorrect. If you change the setup menu after entering a program, the program may have blinking entry fields indicating those entries are inappropriate for the setup. If you change the setup data code or protocol after entering a character string, you must retype the string. The program will fail unless you change either the setup or the program.

Programs are organized in blocks. A maximum of 31 blocks is allowed per program. Blocks provide a reference for looping back or jumping ahead during program execution. When you insert and delete blocks, the numbering is automatically adjusted.

Editing Programs

Use the (Insert Line/Block) and (Delete Line/Block/Prg) softkeys for editing programs. To insert or delete characters in a 'when' string, use the (Insert) or (Delete) softkey. The action is taken at the current cursor position.

The (Delete) key is continuous, the (Insert) key is not. Use the (Insert) key for each character you want to insert. You can delete several characters by holding the (Delete) softkey down.

Executing Programs

To execute a program:

1. If you are not already at the Low Speed WAN Interface (4959) menu, select `Low Speed Analyzer` in the Toolkit by pressing **ENTER**, and then select `Protocol Analyzer` by pressing **ENTER**. This brings up the Low Speed WAN Interface (4959) menu.

2. Press **F5** (Run Menu).

3. Press the appropriate key: **F1** (Monitor Line), **F2** (Monitor Buffer), or **F3** (Simulate).

Defining Triggers

By telling the Advisor to trigger on an event, you are telling it to look for that event in the data stream. The Advisor can trigger on up to 63 different events simultaneously. Once the Advisor has found an event, it can:

- notify you by beeping
- mark a highlighted event in memory
- modify a counter
- start and stop a timer
- branch to another block
- start and stop storing data to disk
- start and stop displaying data on screen
- pause execution
- write a message to the screen
- stop testing

Only the 'when' statement can define a trigger. Press the (When Trig) softkey in the monitor and simulate menus to invoke the 'when' trigger.

Triggers Provide a Reference

'When' statements provide a point of reference in the data stream. They tell the Advisor exactly when to start an action. All 'highlight', 'beep', 'start' and 'stop' statements reference the last preceding 'when' statement in the program. Without a preceding 'when' statement, the Advisor cannot determine the exact point to start, stop, beep, or highlight.

If you put a command at the beginning of the program, action starts at the beginning of execution. But, for an action to start at the precise time that some event occurs, you must use a preceding trigger for that event.

The is a maximum of 63 triggers in a monitor or simulate program.

Types Of Triggers

There are five different types of trigger conditions:

- Characters
- Leads
- Errors
- Timers
- Softkeys

Characters

There are many conditions you can place on characters and character strings. This section explains what characters and character strings are, and how you can define your triggers.

Select (When Trig) and then select the (Text) softkey so you can enter keyboard characters. Press **SHIFT** with another key to access lower case characters. Press **CTRL** and another key to access control characters. See the keyboard diagram in chapter 1 for the locations of the control characters.

Edit Character Strings. Use the cursor keys or the (Delete) and (Insert) softkeys to edit a string. Use (More) to access additional softkeys when the cursor is placed in the string.

Setup After Typing a String. If you change the data code or protocol in the setup menu after typing a character string, you must retype the string to avoid triggering on the wrong characters. Characters in one code may not have the same meaning in another code. The Advisor displays ? if the newly selected code is not compatible with the previous code.

Characters Not On the Keyboard. EBCDIC and some other data codes have control characters not on the keyboard. Enter the hexadecimal equivalent of that character from the keyboard. Hexadecimal characters are displayed with an underline, control characters are not underlined. This is to distinguish the two on the screen. See the keyboard figure in chapter 1 for a complete view of where control characters are located on the keyboard.

Masking Out Characters. Use the don't care condition to mask out string characters or bits of no interest. If any bit in a binary string is designated as 'don't care', the compressed character is denoted by a ? in a box.

Binary and Hex Characters. Select (Hex) to enter characters in hexadecimal; enter two hex digits for each character. Select (Binary) to enter characters in binary. If the setup menu data code is less than eight bits, enter the correct binary digits, right-justified. The excess bits on the left are disregarded.

Use the (Hex) or (Binary) softkeys to enter hexadecimal characters or binary strings. Two hex numbers occupy each character position, requiring two keyboard entries. Hex characters are displayed with an underline to distinguish them from text control characters with the same abbreviation.

When you select (Binary), eight binary bits are displayed, allowing you to enter a 1, 0, or don't care in any bit position. When you move the cursor out of the binary string, it collapses to its hex equivalent but is double underlined to indicate it was entered in binary.

You can see the binary or hex value of a character by placing the cursor over that character and selecting (Hex) or (Binary).

NOTE

Data Code
If the data code selected in the Setup Menu is less than eight bits (e.g., Baudot or Transcode), the appropriate number of higher order bits are disregarded.

Excluding Characters. To trigger on anything except a particular character, select (Not) before selecting the character. The Advisor places a bar over each character that you select until you select (Not*) again.

Flags and Frame Check Characters. Flags and frame check characters are not automatically appended for 'when' strings. Enter these characters with the (Start Flag) and (End Frame) softkeys. End frame characters (the FCS characters and the last flag) may be useful if you wish to trigger on Bad FCS or Abort characters. Triggers for FCS errors or abort characters can only be programmed when a bit oriented protocol is selected on the setup menu.

Parity. The Advisor ignores the parity bit when triggering. You can see this by expanding the specified trigger character in binary when the setup is ASCII 7. The MSB (left) is designated 'don't care.' You can explicitly define this character by entering a 1 or 0 in binary to override the setup Menu. Parity error triggers can be entered only when a character oriented protocol is selected in the setup menu.

Leads

To trigger on lead changes, select the desired lead from the softkeys. Depending on the interface selected and/or pod being used, the appropriate leads automatically appear as softkey choices. The lead trigger is satisfied when the lead goes on or off.

NOTE

Needs a Transition
Unlike an 'if' statement, the lead trigger requires a transition.

Delaying Output. Use 'Wait' statements only with 'Send' and 'Set Lead' statements. Wait has no effect on program flow or timers. If you need to insert program pauses, use timers or counters.

NOTE

Wait Statement
The 'wait' statement controls output only.

The 'wait' command can be set in 1 millisecond increments to cause delays of up to 65,535 milliseconds. In combination with counters, very long delays can be set up.

Errors

You can trigger on the following errors:

Table 11-1: Error Triggers per Setup Parameters

BOPs	sync COPs	async COPs
FCS DTE	Parity DTE	Parity DTE
FCS DCE	Parity DCE	Parity DCE
Abort DTE	BCC DTE	BCC DTE
Abort DCE	BCC DCE	BCC DCE
		Framing DTE
		Framing DCE

Timeouts

You can specify one of five timers in 1 millisecond increments from 0 to 65534.

You can trigger on the timeout of one of the five timers. The Advisor will trigger whenever the timer becomes greater than some specified time in milliseconds. You can select any time from 0 to 65,534 milliseconds. While monitor and simulate programs are limited to a maximum of 63 counters, timer triggers are not included in this number.

Softkeys

The softkeys are numbered from 1 to 6 from left to right. The Advisor can trigger on the press of softkeys 3, 4, and 5.

'When Softkey' triggers can only be recognized when a softkey is pressed while the program is executing in the block which they appear. 'When Softkey' triggers can cause a character trigger in the same block to be missed, if the character trigger is more than one character long. It is a good practice to have only error, lead, or timer triggers in the same block with softkey triggers.

Multiple Triggers

You can combine triggers two ways:

- You can logically 'OR' triggers by putting 'when' statements in the same block.
- You can 'sequence' triggers by putting 'when' statements in different blocks.

ORing Triggers

'When' statements in the same block are ORed. To tell the Advisor to look for both events simultaneously put the 'when' statements in the same block. Once a trigger event is found all other triggers in that block are disabled. If two 'when' statements in the same block are satisfied simultaneously, only the one appearing first in the block is recognized.

```
Block 1:
When DTE  abcd
     then goto Block 2
When Error  Parity on DTE
     or
When Error  Parity on DCE
     then goto Block 3
When Lead  RTS goes On
     then goto Block 4
```

Sequencing Triggers

In this example, the Advisor must find the string 'abcd' on the DCE before it can look for string 'efgh' on the DTE. To get to block 5, the Advisor must find both strings.

```
Block 1:
When DCE abcd
     then goto Block 2
```

```
Block 2:
When DTE  efgh
     then goto Block 5
```

This allows the triggers to be conditionally enabled.

Overlapping and Duplicate Triggers

For overlapping or duplicate triggers in the same block, the one found first disables the other triggers.

In the following example, if the data is 'yabc', only the first 'when' statement is executed. If the data is 'ybc' the second 'when' statement is executed. If the data is 'yc', only the third 'when' statement is satisfied. The first 'when' statement to be satisfied disables the others.

```
Block 1:
When DTE  abc
     then goto Block 2
When DTE  bc
     then goto Block 3
When DTE  c
     then goto Block 4
```

In the following example, if the data is 'ybc', only the trigger 'c's followed.

```
Block 1:
When DTE  c
     then goto Block 2
When DTE  bc
     then goto Block 3
```

When there are multiple trigger strings in a block, some of the triggers may be partially matched at the time one of the triggers is satisfied. If the program loops back for the next 'when' statement, these partial matches are remembered when

triggering resumes. This is useful when looking for strings on both sides of the line. This example, counts the number of times the string 'HELLO' occurs on the DTE and DCE side of the data line.

```
Block 1:
When DTE HELLO
     then goto Block 2
When DCE HELLO
     then goto Block 3

Block 2:
Increment counter 1 by 1
     and then
     goto Block 1

Block 3:
Increment counter 2 by 1
     and then
     goto Block 1
```

The Advisor begins matching triggers as the data comes in. When the 'O' comes in on DTE, the first when statement is matched. If, at the same time, the first four characters of the second when statement are already matched (since the program returns to block 1 for the next set of triggers) the partial match is remembered. When the final character on the DCE hello is received, the match on the second when statement is completed.

Marking Triggers

The Advisor can mark each event you specify in the buffer by beeping or highlighting the event. Each marking condition refers to the last preceding trigger event.

Beep

The 'beep' statement provides an audible sound for some specified condition. The Advisor can beep anytime, and as often as desired.

Highlight

Use the 'highlight' command after a 'when' statement to mark trigger events in the buffer. Highlighted characters appear in half-bright, inverse video in the Examine Data menu.

Lead and timer transitions appear on the DCE line in the Examine Data menu if you are not using the Data and State display.

The Advisor remembers the last 64 highlights in the buffer (not disk). Only the last character of a trigger string is highlighted.

NOTE

Not to Disk
Highlights are not stored to disk when the data file is saved away (either .m&d or .buf).

Measuring Time

Timers measure the time between triggers. The Advisor monitor and simulate menus each contain five timers, 1, 2, 3, 4, and 5. Each timer can measure up to 65,535 milliseconds.

Time Stamps

Timers measure by looking at time stamps that are inserted with the data entering the Advisor.

In order to make accurate timing measurements, the bits/sec field of the Setup menu should match the line rate. Time stamps are stored in the buffer depending upon the bits/sec selection. If bits/sec is slower than the line rate timing measurement resolution is reduced. If bits/sec is faster than the line rate the buffer is filled with more time stamps than necessary and storage efficiency is reduced.

In bit oriented protocols, the start flag and address of a string have the same time mark. This is also true of the last character, the FCS, and the end flag.

Timers

Timers measure the interval between trigger events. A timer must have a reference point to start and stop. Triggers provide a reference because they point to real events in the data stream.

To measure the time interval between two events, use two trigger statements to identify the events. After one trigger statement identifies the first event, start the timer. When the second trigger statement identifies the second event, stop the timer.

Timers are set to zero at the start of program execution and can be reset during program execution with a 'reset' statement.

Stop a Timer Without Resetting. Timers can be stopped with either a 'stop timer' or a 'stop tests' statement.

NOTE

No Stop Tests
Do not use a 'Stop Tests' statement unless you want to stop program execution.

Effects Of the Data Filter On Timing

You cannot measure time if the data filter is turned on because the time stamps are filtered out of the data stream. And if you have 'timing information' turned off in the data filter your timing measurements will be inaccurate. The data filter can be found by selecting (Run Menu).

NOTE

Timing Information
Make sure 'timing information' is turned on in the data filter before you try to measure time.

Cursor timing is meant to be used only when timing information is enabled. Timers in Monitor and Simulate menus do not work at all if the timing information is disabled when data is captured.

Timing information should only be disabled to retain the maximum amount of data in the capture buffer, especially in line use situations. One time stamp is inserted in the incoming data stream for each six bits. With low line usage, this will fill the buffer with more time stamps than is necessary.

Lead Changes

Timing on lead changes is exact to the resolution provided by the data rate selection in the setup menu. Lead changes on the T and R lines (when an X.21 protocol is selected) are exceptions. Timing information for the T and R lines is delayed 16 bit times from the beginning of a steady state '1' or '0'. Timing on these signals represents when the lead should be recognized as a steady state '1' or '0', and not when the steady state signal began.

COP Send Strings

Data sent by the Advisor in character-oriented protocols (using send strings) has a two-bit offset in the timing information. Each transmitted character actually begins two bit times after the time reported by a cursor timing measurement.

Data received by the Advisor in character-oriented protocols is time stamped two bit times after each character is completed. So the delay from the start of each character to its time stamp is one character time plus two bit times.

The last character in a sync pattern has an added delay of one more character time. So the delay from the start of the last sync character to its time stamp is two character times plus two bit times.

The first character in a two character sync pattern has an added delay of still another character time.

Bit-Oriented Protocols

Data in bit-oriented protocols is time stamped in the same way whether it is sent or received by the Advisor.

The start flag time stamp has a delay equal to 26 bit times plus one bit time for each zero automatically inserted in the bit stream of the first two characters following the start flag. A zero is automatically inserted after a series of five consecutive ones.

The first byte (address) has a time stamp delay of 18 bit times plus one bit time for each zero inserted during its own transmission or during the following byte. The result is that a cursor timing measurement from the start flag to the first byte shows `time = 0.0 ms`.

All other bytes, except the Frame Check Sequence (FCS), are time stamped 34 bit times after they begin, plus one bit time for each zero inserted after any of these 34 bits.

The first byte of the FCS is time stamped 24 bit times after it begins plus one bit time for each inserted zero. The second FCS character is time stamped 16 bit times after it begins plus one bit time for each inserted zero.

The end flag time stamp has a delay of eight bit times.

Timing Resolution

Timing resolution is the smallest unit of measurement that can be timed at a given speed. The following table gives the resolution for speed ranges:

Table 11-2: Timing Resolution

Data Rate Selection	Resolution
50-2400	1.0 msec
3200-4800	0.5 msec
7200-9600	0.2 msec
12 k - 64 kbps	0.1 msec

Cursor Timing Limits

The maximum cursor time that can be measured before an overflow will occur is given in the table below. To determine the maximum cursor time that can be measured, select the speed (Bits/sec) and the corresponding maximum cursor time is given to the right in the table. If an overflow does occur, you will have to use the Monitor menu timers and run from buffer data.

Table 11-3: Cursor Timing Limits

Bits/sec	Maximum Cursor Time
50 - 2400	66.24 seconds
3200 - 4800	33.14 seconds
7200 - 9600	13.28 seconds
12 k - 64 kbps	6.66 seconds

At 64 kbps full duplex, data may be time stamped so that occasional groups of two or three sequential characters appear to be simultaneous. This has no cumulative effect.

Counting Events

The Advisor has five counters that can count five different events simultaneously. The counter can be incremented by any number up to 65,535. For example, if you increment counter 4 by 2 every time an event occurs, the statement looks like this:

```
Increment Counter 4 by 2
```

Countable Events

Countable events can be characters or character strings, lead changes, timer changes, counter changes, or program loops. Almost any action the Advisor performs can be counted. Place the increment counter statement directly after the event of interest.

Maximum Count

Each counter counts to 65,535 and then starts over from zero. You can cascade counters by having one counter increment whenever a second counter overflows.

Resetting Counters

Counters are always reset to zero at the start of execution. Counters can be reset with the 'reset counter' statement. When they are reset during a program, they go to zero and do not restart unless you start them again with an 'increment counter' statement.

Decrementing Counters

To decrement a counter by 1, set the increment value to 65,535 rather than 1. To decrement by 2, set the increment value to 65,534. And so on.

Branching

You can cause a conditional branch in the program using the 'if' statement or an unconditional branch with a 'goto block' statement. The 'if' statement branches if a condition is satisfied. The 'goto block' statement forces a branch regardless of any conditions.

Conditional Branching

Tell the Advisor when to test lead status with a trigger. 'If lead' statements always test the link at the time the last trigger was found. There should always be a trigger statement before the 'if' statement.

A trigger must be used to define the exact time, therefore a 'when' statement must appear earlier in the program when using 'if lead'. An 'if lead' statement always refers to the lead condition at the time of the last trigger.

If Counter

Counters run independently of line status. Therefore, 'if counter' statements do not need to be preceded by 'when' statements.

To use the 'if counter' command, press (Counter) and select the counter number. Then type the comparison number. You can enter any number from 0 to 65,534.

How 'If' and 'When' Are Different

Only 'when' can define a trigger and wait for an event. 'If' tests the current status. Unlike 'if', the 'when' statement pauses program execution until the trigger is satisfied.

Combining 'If'Statements

'If' statements in the same block are 'ORed'. The Advisor looks for all the conditions at the same time. The first satisfied 'if' controls the branch.

Combining 'If' and 'When'

'If' can be used to guarantee action. For example, if you enter:

```
When Lead RTS goes Off
     then goto Block 2
```

and RTS is already off, the program never moves. No program statements are executed until the trigger is satisfied. The 'when' statement requires a transition. On the other hand, if you enter:

```
If Lead RTS is Off
     then goto Block 2
```

and RTS is on when the 'if' statement is executed, the program will never go to block 2. Unlike the 'when' statement, 'if' does not wait for a condition to happen. To ensure that execution always moves to block 2 when RTS goes off, enter the following:

```
If Lead RTS is Off
     then goto Block 2
When Lead RTS goes Off
     then goto Block 2
```

Unconditional Branching

An unconditional branch forces a jump in the program. Use the 'goto block' or 'gosub' command to branch to a different part of the monitor or simulate program.

'If' and 'When' Always Force a Branch

Both 'if' and 'when' commands automatically append a conditional 'goto block' statement.

You can use 'goto block' to loop continuously. In the following example, you increment counter 1 until it reaches 200 and then jump out of the loop.

```
Block 1:
Increment Counter 1 by 1
If Counter 1 > 199
     then goto Block 3
Block 2:
Goto Block 1
```

Program Pauses

There are many times in a program you must enter a pause statement.

Pause Example

Wait 40 milliseconds for a relay to open before performing the next program command.

NOTE

Not wait statement
Do not use the 'wait' statement in the simulate menu to delay simulate programs. 'Wait' affects 'send' and 'set lead' output statements.

A timer is the best way to insert a program delay without multiple triggers (NOTE - this program only works if there is data being received).

```
Block 1:
Beep
     and then
Start Timer 1
When Timer 1 > 3000
     then goto Block 2

Block 2:
Reset Timer 1
     and then
Goto Block 1
```

Using a timer to delay is not always the right solution. Timer status can only be tested with a 'when' trigger. The trigger pointer moves through the data looking for the trigger event, but cannot move backwards.

Starting and Stopping Commands

You can control the display or the disk using 'start' and 'stop' commands. The 'stop tests' command halts program execution.

There are two ways to provide a reference point for 'start' and 'stop' commands:

- Start of execution. If you put a 'start' or 'stop' command at the beginning of the program, it becomes active when you begin program execution.
- Preceding trigger. The last 'when' statement in the program provides a reference.

A 'start' or 'stop' becomes active when the last trigger event was found. If you insert a program pause using a timer or counter, 'start' or 'stop' is delayed by the amount of the pause.

Filtering Data With 'Start' and 'Stop'

The 'start' and 'stop' commands can filter events of interest. Define an event in a 'when' statement and then start or stop the display or disk when that event occurs.

'Start' and 'Stop' Disk

You can start and stop the disk to capture only events of interest as often as you like. The following rules apply to 'start' and 'stop' disk statements:

- The disk can be started and stopped more than once.
- The 'start' command stores 256 bytes of the buffer preceding the event. The 'stop' command stores 256 bytes of the buffer after the event (256 bytes may be up to 125 characters depending on time stamp frequency and line utility). There is no way to indicate the event on the disk because highlights are not stored to disk.

- Timing measurements should not be made across fragmented data segments which have been gathered by pressing 'Start' and 'Stop' disk. The results could be in error.

NOTE

Not from the buffer
'Start Disk' is ignored when running from the buffer.

When you execute a monitor or simulate program with a 'start disk' statement, data is stored to the disk drive selected in the **F9** Config menu. For hard drives, data is stored to the disk buffer created in the Toolkit's Disk Buffer Manager. When storing to hard disks, make sure you 'Extract' the data to a *.m&d file or files immediately afterwards.

NOTE

Do Not stream to floppy
Data should not be stored to the floppy drive while running because of excessive wear to the read/write heads.

'Start' and 'Stop' Display

The 'stop display' statement freezes the display after the occurrence of a trigger event. That trigger event and the preceding data are displayed on the screen. Execution is not stopped even though the display is turned off. The buffer is continually being filled with new data. To start the display again, use a 'start display' statement, or the (Start Display) softkey.

NOTE

Turn the display off
It is more efficient to turn the display off if you are running a program that causes buffer overflow errors.

Stop Tests

The 'stop tests' statement halts program execution. No new data is loaded into the buffer, the disk stops, and any active timers stop.

- A 'stop tests' command is executed only after all the 'wait', 'send', and 'set lead' statements prior to it are performed.
- The 'stop tests' statement halts execution of all other program statements.
- If there are no 'when' statements in the program, the display will continue running until rule 1 is satisfied.
- The **EXIT** key is the only way to halt immediately.

Message Capabilities

The Advisor lets you input 16 characters in the 'message' statement. These messages are also displayed at the bottom of the screen during execution. Messages are entered the same way as send strings, except that characters can only be inserted or deleted. Hex characters cannot be entered. Some sample reasons for entering messages are:

- You can have the Advisor tell you to perform some action during execution, such as pressing a softkey.
- You can label softkeys 3, 4, and 5, which are those used for softkey triggers.
- You can display a status message to tell users how a test is proceeding.

Entering Messages

Select (Message) and begin typing text after `Message`. Messages can be up to 16 characters long (including spaces).

You must enter something in the message field, even if it is only blanks. If you do not enter anything in the field, an error message appears when you try to execute.

NOTE

Fill the field
It is recommended to fill in all 16 characters of the message field, using spaces as necessary.

If a message is not 16 characters, some characters of a previous message may still show on the display.

Entering Messages Example

If your first message was EXIT RUN PROGRAM, and the second message was START PROGRAM, the display after the second message would be START PROGRAMRAM. Filling the rest of the second message with spaces would fix the problem.

If a message is used to label softkeys 3, 4, and 5, the example just described becomes an advantage. A message can be sent to label the three softkeys. Later in the program, a new message can change one of the softkeys and leave the others.

Subprograms

You can enter subprograms using the 'gosub block' and 'return' commands. You can nest up to eight subroutines. Subprograms are useful if a sequence of statements is used repeatedly in the program. Enter the sequence of statements once. If you put a 'return' statement at the end of the sequence, you can call that sequence anytime with a 'gosub block' statement.

The 'gosub block' statement causes a jump to the designated block. The 'return' statement causes a jump back to the line immediately following the 'gosub block' statement.

Subprogram Error Example

For example, there are several places in a program where one of three different error messages might need to be displayed. Instead of entering all of the different error messages in the program repeatedly you can enter three subprograms.

```
Block x:
Message  This is BCC Err
     and then
Return

Block xx:
Message  This is Par. Err
     and then
Return

Block xxx:
Message  This is Frame Err
     and then
Return
```

Subprogram Delay Example

The same five second delay is used three times.

```
Block 5:
Start Display
     and then
Gosub Block 25

Block 6:
Stop Display
     and then
Gosub Block 25

Block 7:
Start Display
     and then
Gosub Block 25
....
Block 25:
Start Timer 1
When Timer 1 > 5000
     then goto Block 26

Block 26:
Reset Timer 1
     and then
Return
```

Level 2 Programming

The Advisor assists you in entering level 2 and level 3 'send' and 'when' strings. This extension of softkey programming is in the monitor and simulate menus.

NOTE

Must be BOPs
The setup menu protocol must be bit oriented, e.g., SDLC, HDLC, or X.25.

The 'send' command is available only in the simulate menu. However, the level 2 and 3 assisted mode is similar for 'when' and 'send' strings.

As you type in each entry the cursor automatically moves to the next entry position. A prompt appears to tell you the next entry and the previous entry. The prompting message also appears when you manually move the cursor with the cursor keys. For the cursor to move automatically to the next entry position, you must actually type in an entry, even if it is the same as the present entry. Of course, you can always move the left and right cursor keys to the adjacent field.

The Level 2 softkey allows the entry of the Address (Extended if present), Frame bits, Frame type, Poll/Final bit, N(S) (if present), and N(R) (if present).

To enter the level 2 assisted mode from a monitor or simulate menu, select (when) or (send) and then select (level 2).

Address Field

You are asked to enter (in hex) a value for the address field. This prompt is displayed at the bottom of the Advisor display. If the right-cursor key is pressed before entering an address, it defaults to 00 hex.

Extended Addressing

If extended addressing is on in the setup menu, two softkeys appear in the address field: (End Addr) and (Extend). Selecting (Extend) sets the least significant bit (LSB) to 0 and then adds a new byte to the address field, if necessary. Selecting (End Addr) ends the address field by setting the LSB at the cursor position to 1.

Frame Type

After entering the address, you are prompted to enter the frame type.

I-Frame

When you select I-frame, the LSB (farthest right) is set to zero. Then you are prompted to fill three fields: P/F is one bit, N(R) and N(S) are three bits each.

```
N(R)  |  P/F  |  N(S)  |  0
```

N(S)	Takes on values 0-7 if extended control (in the setup menu) is off; 0-127 if extended control is on. If a number greater than the upper limit is entered, N(S) defaults to the upper limit.
P/F	Enter a 1 or 0 in the P/F field.
N(R)	Same as N(S). After you enter a value for N(R), it exits from level 2 entry.

S-Frame

When you select S-frame, the LSB (farthest right) are set to 01. Then you are prompted to fill the next three fields from right to left. S-frame type is two bits, P/F is one bit, N(R) is three bits.

```
N(R)  |  P/F  |  type  |  01
```

After entering the S-frame type, you are then prompted to enter the P/F field and then the N(R) field. After entering N(R) the Advisor exits from the level 2 entry mode.

U-Frame

When you select U-frame, the two LSBs (farthest right) are set to 11. You are then prompted to select the type of U-frame.

The type of U-frame is defined by two 3-bit fields filled at the same time when you select U-frame type from the softkeys. The default value for the U-frame type is UI. The P/F field requires one bit.

```
type | P/F | type | 11
```

After entering P/F the Advisor exits you from the level 2 entry mode.

Level 3 Programming

NOTE

Level 3 Programming is for X.25 ONLY

Packets are entered by selecting Level 3 and then the entry point, general format identifier (GFI), logical channel number (LCN), or packet type. When GFI is chosen, the Q and D bits and the modulo 8 or 128 can be entered. If packet type is chosen, softkeys appear for 17 different packet types.

The (Level 3) softkey enables you to enter the three fields of the packet header: GFI, LCN, and Packet Type. For most packets, these each take up one byte. Some packet types, however, require a longer packet header. The packet header normally follows the first two bytes of level 2 information, 'address' and 'control.'

```
flag | address | control | GFI | LCN | packet type
```

Of course, if either `extended address` or `extended control` in the setup menu are on, there may be more than two level 2 bytes. Frame type also determines the number of level 2 fields.

NOTE

Moving the cursor
If you move the cursor too far and drop out of assisted mode, select the (Level 2) or (Level 3) softkeys again. Then move the cursor to the desired field.

Selecting Level 3 Before Level 2

In this case, zeroes are automatically appended for the level 2 bytes in send strings, and 'don't cares' in trigger strings. Unless `extended address` or `extended control` in the setup menu are on, the cursor is positioned on the third byte, 10 hex. Flags are shown by '|', and a good frame check sequence by GG.

```
| 000010GG |
```

When you select (Level 3), three new softkeys appear allowing you to enter the packet header from three different points: GFI, LCN, and Packet Type.

If LCN is selected before GFI (missing GFI), the Q and D bits are set to zero, modulo 8 is selected, and the LCGN is set to zero (don't cares for trigger strings).

If Packet Type is selected first (missing GFI and LCN), GFI is set the same as above, and the LCN is also set to zeros (don't cares for trigger strings).

GFI Field

The GFI byte consists of four fields from left to right: Q, D, MOD, and LCGN. Q and D consist of one bit each, Mod is a 2-bit field, and LCGN is a 4-bit field.

```
Q | D | mod | LCGN
```

Q Bit	Selecting the GFI softkey prompts you to enter a 1 or 0 for the Q bit. When you enter a value for the Q bit or press the right-cursor key, the D-bit prompt appears.
D bit	When you enter the D bit or press the right-cursor key, the D prompt appears.
Mod	Select either (Mod 8) or (Mod 128) to select either 01 or 10 for the two-bit mod field. Entering a value for the mod field or pressing the → causes the LCGN prompt to appear. Selecting (Mod 128) causes the packet type field to expand to two bytes for some packet types (see the Packet Type Field).
LCGN	The LCGN is a four-bit field which you can enter with a decimal value from 0 - 15.

LCN Field

The LCN field is the next byte to the right of the GFI byte. You can use either decimal or hex entry to select values from 0-255 or 00-FF.

Packet Type Field

When the last digit of the LCN is entered, the 'packet-type' field appears. The default packet type is Data. If Mod 128 was chosen in the GFI field, the packet-type field expands to two bytes for some packet types, as described below.

The Packet-Type field for a data packet is like the control field for an I-frame. Entry of the P(S), M, and P(R) is just like the entry of N(S), P/F, and N(R) fields. When you select a Data packet, the LSB (far right) becomes zero. Then you are prompted to fill three fields from right to left. P(S) and P(R) each require three bits; M requires one bit.

```
P(R) | M | P(S) | 0
```

If you selected Mod 128 in the GFI, the packet-type field consists of two bytes rather than one. P(S) and P(R) each take up seven bits.

Other Packet Types

RR, REJ, and RNR packet types have a P(R) field. All other packet types do not have any such fields except Data.

Conditions when Simulating

The line does not display idles or store idles in the buffer unless the send characters are explicitly placed in the send string.

Block Check Characters

In character oriented protocols, the Advisor automatically appends the correct Block Check Characters (BCC) to 'send' strings. You can see this character at run-time or in the buffer after a run. In 'char' protocol setup you can select the characters on which error checking is to start and stop. In the setup menu, the 'start on' selection begins error checking following the designated character. The 'stop on' character includes the designated character in the error check.

NOTE

Automatic for BSC
Bisync automatically appends BCC characters. The start and stop characters are preset.

The BCC is automatically generated for the first required BCC. For any subsequent BCC blocks of text or data within the same sync pattern, you must enter BCC manually into the string.

Frame Check Sequence

Flags and frame check sequence (FCS) characters are automatically added when a bit oriented protocol (HDLC, SDLC, X.25) is selected.

For received data, GG, BB, or AA are displayed to indicate 'good FCS', 'bad FCS', or 'abort'. For 'send' strings, good FCS characters (GG) are automatically selected; but you may choose bad FCS (BB) characters or abort (AA) characters

by selecting (End Frame) and then selecting either (Bad FCS) or (Abort). Flags and frame check characters disappear if you change the setup to a character oriented protocol and again move the cursor into the string.

In bit oriented protocols, the Advisor automatically inserts a 0 (invisible to you) after five consecutive 1's before transmitting non-flag characters (invisible to the user). When receiving, it automatically removes any 0 bits inserted by the transmitter.

Set Lead

The 'set lead' command turns a selected interface lead on (SPACE) or off (MARK). With an EIA-232C/V.24 interface, a lead is on when the voltage is greater than +3V and off when the voltage is less than -3V. The protocol idles in the SPACE condition.

Lead Status During Simulation

When simulating, only the appropriate lead softkeys are displayed. At the beginning of simulate execution, the Advisor sets all the leads it can drive to off. You must use 'set lead' statements to perform handshaking with the receiving device.

Because the Advisor always sets the appropriate DTE or DCE leads off at the beginning of the simulation run, 'set lead' statements are needed to turn the appropriate leads on before sending data. If this is not done, the receiving device might not accept data from the Advisor.

NOTE

Set Leads
Determine which interface leads must be set on or off before sending data. Otherwise, the receiving equipment may not accept the data.

Glossary

This glossary is a general explanation of terms that are used in this manual. The terms are not necessarily Hewlett-Packard specific, but are for data communications in general.

A

ADCCP (Advanced Data Communication Control Procedure)

This level 2 protocol was developed by ANSI (American National Standards Institute). All data transmissions are in frames, and the starting flag, address, and control fields are known as "header" information and the FCS and ending flags are known as "trailer" information.

Advanced Data Communication Control Procedure (ADCCP)

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Alternate Mark Inversion (AMI)

The bipolar AMI format alternates the polarity of each 1 (or mark). The first 1 is sent as a positive signal; the second 1 as a negative signal; and so on. On a T1 line, two consecutive 1s of the same polarity cause a "bipolar violation" and indicate an error on the line.

American Standard Code for Information Interchange (ASCII)

ASCII utilizes seven bits to represent numbers, letters of the alphabet, and special characters to be transmitted.

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ASCII (American Standard Code for Information Interchange)

ASCII utilizes seven bits to represent numbers, letters of the alphabet, and special characters to be transmitted.

Auto Configure

The Advisor can sample line data and automatically make Advisor settings (auto configure) to correctly monitor a line.

B

B8ZS (Bipolar 8 Zero Substitution)

B8ZS deals with the one's density (or zero constraint) rules. Whenever eight zeros in a row are seen on the line, a special B8ZS code is sent.

Backward Explicit Notification Bit (BECN)

In Frame Relay, the BECN bit notifies the sending node (or source end) that there is congestion in the opposite direction of the data flow.

Bandwidth

The maximum rate that data can be sent without errors measured in bits per second (or bps).

BCC (Block Check Character)

An error checking character that is appended to a character-oriented protocol by the transmitter. The BCC is automatically appended to send strings in the Simulate menu.

BECN (Backward Explicit Notification Bit)

In Frame Relay, the BECN bit notifies the sending node (or source end) that there is congestion in the opposite direction of the data flow.

BERT

Bit Error Rate Tests (BERT) measure analog noise on a digital circuit. You can determine how often highs are erroneously changed to lows and lows to highs.

Bipolar 8 Zero Substitution (B8ZS)

B8ZS deals with the one's density (or zero constraint) rules. Whenever eight zeros in a row are seen on the line, a special B8ZS code is sent.

Bisync (BSC)

Most common character-oriented protocol that predefines sync characters depending upon data code.

Bit Count

The number of actual data bits sent since synchronization (excluding framing, start, stop, and parity bits).

Bit Error Rate
The number of bit errors divided by the number of bits received.

Bit Error Rate Tests (BERT)
BERT measures analog noise on a digital circuit. You can determine how often highs are erroneously changed to lows and lows to highs.

Bit Oriented Protocols (BOPs)
Bit Oriented protocols are level 2 protocols developed for a variety of system requirements. Some of the more common BOPs are HDLC, SDLC, ADCCP, and LAPB.

Block
Bits are grouped in blocks for measuring block error rate, sometimes referred to as BLERT.

Block Count
Tells how many blocks have been sent thus far in a test.

Block Error Rate
The number of block errors divided by the number of blocks received. Whether there is one error or ten errors in a block, it is still counted as one block error.

Block Errors
Tells how many blocks had at least one error.

Block Sizes
The Bell system uses a block size of 1000 bits. CCITT, the world-wide standard, uses a block size equal to the pattern size. For example, if the PRBS pattern is 511 bits, then the block size would also be 511 bits.

BOPs (Bit Oriented Protocols)
Bit Oriented protocols are level 2 protocols developed for a variety of system requirements. Some of the more common BOPs are HDLC, SDLC, ADCCP, and LAPB.

bps
bits per second.

BSC (Bisync)
Most common character-oriented protocol that predefines sync characters depending upon data code.

C

Character-oriented protocol (COPs)
Half-duplex protocol that utilizes each significant character.

Control field
Field used to identify an I-frame, S-frame, and U-frame and control the behavior of the frame.

CRC (Cyclic Redundancy Checking)
A method of checking the valid transfer of data in equipment that doesn't do character checking.

Cyclic Redundancy Checking (CRC)
A method of checking the valid transfer of data in equipment that doesn't do character checking.

D

D/E (Discard Eligibility Bit)
In Frame Relay, this bit identifies frames that can be discarded.

D4 Frame
A D4 frame is a group of 193 bits that makes up a single transmission in T1 networks. This frame may be unformatted (193 continuous bits) or formatted (24 DS0 channels). Each 193 bit frame is made up of 192 bits with one framing bit (F bit).

Data Link Connection Identifier (DLCI)
The Data Link Connection Identifier (DLCI) is made up of six bits in a frame relay frame. All DLCIs are listed in a table. A DLCI checks the integrity of the frame using a Frame Check Sequence (FCS). If an error is found, the frame is deleted.

Data Link Layer
Level 2 of the seven level OSI reference model defined by ISO. This layer provides the link access control and reliability to networks.

DCE
Data Communications Equipment

Digital Signal, level one (DS-1)
DS-1 is the 1.544 Mbps signal generated at the output of a T1 network such as a channel bank, MUX, or digital PBX. DS-1 normally transfers 24 channels of DS-0 and can be used with SF or ESF framing.

Digital Signal, level zero (DS-0)
DS-0 is the 64 Kbps single-channel signal generated by T1 and used in terminal devices such as a channel bank, MUX, or digital PBX.

Discard Eligibility Bit (D/E)
In Frame Relay, this bit identifies frames that can be discarded.

DLCI (Data Link Connection Identifier)
The Data Link Connection Identifier (DLCI) is made up of six bits in a frame relay frame. All DLCIs are listed in a table. A DLCI checks the integrity of the frame using a Frame Check Sequence (FCS). If an error is found, the frame is deleted.

Download
A remote operation that transfers data, menus, or applications from a controller Advisor to a remote slave Advisor.

DS-0 (Digital Signal, level zero)
DS-0 is the 64 Kbit/s single-channel signal generated by T1 and used in terminal devices such as a channel bank, MUX, or digital PBX.

DS-1 (Digital Signal, level one)
DS-1 is the 1.544 Mbps signal generated at the output of a T1 network such as a channel bank, MUX, or digital PBX. DS-1 normally transfers 24 channels of DS-0 and can be used with SF or ESF framing.

DSU/CSU (Data Service Unit/Channel Service Unit)
DSU/CSU is a term commonly applied to equipment at the customer premises (equipment) side or the company (line) side of a network.

DTE
Data Terminal Equipment

E

Elapsed Seconds
Elapsed time since receiver synchronization.

Emulation
An Advisor enters the network as a DCE or DTE. This technique exercises the network with known (user defined) data. Emulation differs from simulation in that it provides the interaction necessary to emulate a device on the network.

Equipment Build Out
This is an option used to set the transmitter signal level and pulse shape to match the length of cable to the first repeater on the network.

Errored Seconds
Tells how many of the elapsed seconds had errors.

ESF (Extended Superframe Format)
An Extended Superframe consists of 24 frames with 193 bits each. One of the 193 bits is used for framing and called the framing bit. In ESF, not all of the framing bits (24) are needed. Six of these framing bits are used for framing, six are used for a CRC, and the remaining 12 bits make up a data link for control and maintenance.

F

FCS (Frame Check Sequence)
An error checking character that is appended to a bit-oriented protocol by the transmitter.

FECN (Forward Explicit Notification Bit)
In Frame Relay, the FECN bit notifies the sending node (or source end) that there is congestion in the direction of the data flow.

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Fractional T1 (FT1)
A method of providing T1 service in 64 kbit/s units (for example - 256 kbit/s or 128 kbit/s). For Nx64 capability, clear channels (64 kbit/s) are provided by using B8ZS coding or ones insertion. The ones insertion is usually done by

using every other timeslot for customer data and filling the in-between timeslots with ones, or by setting one bit per timeslot to one (in that case, the service is Nx56).

Frame

A frame is a unit of information transferred on a network which contains control and data information.

Frame Check Sequence (FCS)

An error checking character that is appended to a bit-oriented protocol by the transmitter.

Frame Relay

Frame Relay is an interface protocol which provides efficient transport of variable units of data (frames) from sources to destinations over a physical connection.

Fs (Signal Framing)

The framing bit (f) identifies frames 6 and 12 in which signaling states, A and B are transmitted when traffic on a network is channelized voice service.

Ft (Terminal Framing)

The framing bit (F bit) identifies the frame boundaries in a Frame Relay frame.

FT1 (Fractional T1)

A method of providing T1 service in 64 kbit/s units (for example - 256 kbit/s or 128 kbit/s). For Nx64 capability, clear channels (64 kbit/s) are provided by using B8ZS coding or ones insertion. The ones insertion is usually done by using every other timeslot for customer data and filling the in-between timeslots with ones, or by setting one bit per timeslot to one (in that case, the service is Nx56).

H

HDLC (High Level Data Link Control)

This level 2 protocol was developed by ISO (International Standards Organization). All data transmissions are in frames, and the starting flag, address, and control fields are known as "header" information and the FCS and ending flags are known as "trailer" information.

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I

I-frame

Information frame (level 2) used to carry user data.

IPARS

International Passenger Airline Reservation System is used by most airlines. IPARS is a character-oriented protocol with six-bit data code and inverted bit sense.

Isochronous

Isochronous transmission is BERT asynchronous data with the Advisor acting as a DCE with an internal X1 clock.

L

LAN (Local Area Network)

A short distance network (up to a few thousand meters) used to connect many network devices using a communication standard.

LAP-B (Link Access Procedure, Balanced)

This level 2 protocol was developed by CCITT (International Telegraph and Telephone Consultative Committee) as a part of the X.25 network standard. All data transmissions are in frames, and the starting flag, address, and control fields are known as "header" information and the FCS and ending flags are known as "trailer" information.

Leased Line

Permanent connection for private use within a data communication network independent of the public switching and signalling equipment.

Line Build Out

This is an option used to set the transmitter signal level and pulse shape to match the length of cable to the first repeater on the network.

Link Access Procedure, Balanced (LAP-B)
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Longitudinal Redundancy Check (LRC)
A technique for error checking in the data stream where each character plus parity is used to calculate errors.

M

Mass Store Device
Devices used to store menus, data, and applications.

Monitor
Non-intrusive method of looking at the data stream on a line.

Multi-drop configuration
A remote configuration that has a controlling Advisor connected to more that one slave.

N

N(R)
Receive Sequence Number.

N(S)
Send Sequence Number.

Network Layer
Level 3 of the seven level OSI reference model defined by ISO. This layer provides the routing of data through the network.

NRZI Non-Return to Zero Inverted
With no clock present, the clocking signal is embedded in the data stream.

Nx56

Nx56 is used to represent the number of 56 Kbps channels to be used by a connection where N represents the number of channels. A connection using 2x56, for example, has 112 Kbps of bandwidth available, and uses 2 of the 24 individual 56 Kbps time slots in a channel.

Nx64

Nx64 is used to represent the number of 64 Kbps channels to be used by a connection where N represents the number of channels. A connection using 3x64, for example, has 192 Kbps of bandwidth available, and uses 3 of the 24 individual 64 Kbps time slots in a channel.

O

Octet

The common term used for a collection of 8 bits is a byte. In some cases, the term used is an octet. Although many people use these terms interchangeably, there are a few differences. The bits of a byte are normally numbered from 0 to 7. The bits of an octet are generally numbered from 1 to 8. While the 4th bit of both a byte and an octet are the same, "bit 4" of each is a different bit.

P

P/F

Poll/Final bit.

Packet Switching

A technique implemented by the Public Data Networks where all data transfers are broken up in fixed length blocks (usually 128 bytes) surrounded by control information.

Permanent Virtual Circuit

A permanent virtual circuit is a permanent association between two DDS, established by the user when subscribing to a packet-switched network and is similar to a leased line.

Physical Layer

Level 1 of the seven level OSI reference model defined by ISO. This layer provides the electrical, mechanical, and other physical aspects for a network.

Point-to-point configuration

A remote configuration that has two Advisors connected to each end.

PRBS (Pseudo Random Bit Sequence)

A BERT tester generates pseudo random bit sequences from a shift register of length L, where the sequence length equals 2^L - 1 bits. A PRBS may be of any length but certain pattern lengths have become standard. The Advisor uses PRBS lengths of 63, 511, 2047, or 4095.

Pseudo Random Bit Sequence (PRBS)

A BERT tester generates pseudo random bit sequences from a shift register of length L, where the sequence length equals 2^L - 1 bits. A PRBS may be of any length but certain pattern lengths have become standard. The Advisor uses PRBS lengths of 63, 511, 2047, or 4095.

R

RS-232C/V.24

Most common level 1 interface up to 20 Kbps and 50 feet. It is a 25 pin interface and uses an unbalanced single end generator and receiver.

RS-449

Mechanical standard that defines 37 pins plus nine secondary channels. This mechanical standard uses two electrical standards; EIA-423A/V.10 and EIA-422A/V.11.

S

S-frame

Supervisory frame (level 2) used to acknowledge or reject frames.

SDLC (Synchronous Data Link Control)

This level 2 protocol was developed by IBM. While it is not actually a standard (as being defined by a standards organization) it is commonly used. All data transmissions are in frames, and the starting flag, address, and control fields are known as "header" information and the FCS and ending flags are known as "trailer" information.

Signal Framing (Fs)

The framing bit (f) identifies frames 6 and 12 in which signaling states, A and B are transmitted when traffic on a network is channelized voice service.

Simulation

An Advisor enters the network as a DCE or DTE. This technique exercises the network with known (user defined) data.

Switched Virtual Circuit

Temporary association between two DDS established by the calling DTE sending a call request packet to the packet-switched network. This circuit is held for the duration of the call.

Synchronous Data Link Control (SDLC)

This level 2 protocol was developed by IBM. While it is not actually a standard (as being defined by a standards organization) it is commonly used. All data transmissions are in frames, and the starting flag, address, and control fields are known as "header" information and the FCS and ending flags are known as "trailer" information.

T

T1

T1 is a 1.544 Mbps network.

Timing Resolution

Smallest unit of measurement that can be timed at a given speed.

Toolkit

The User Interface for the Low Speed Internet Advisor.

Transparent Text

Text that is masked out in the data stream. You can selectively define transparent text so a receiver will accept unexpected characters.

Trigger

When a programming condition is defined, a trigger is used to alter program execution. The Advisor defines triggers with a 'when' condition.

U

U-frame

Unnumbered frames (level 2) used to initialize and disconnect the DTE/DCE link.

Upload

A remote operation that transfers data, menus, or applications from a remote slave Advisor to a controller Advisor.

V

V-Series
The term associated with using a interface such as RS-232C, RS-449, V.35, etc.

V.35
A digital interface transmitting data at 48 kbps. This interface is for clock and data signals with each signal requiring a pair of wires. This is a typical interface for 56 kbps DDS lines.

Vertical Redundancy Check (VRC)
A technique for error checking in the data stream where each character plus parity is used to calculate for errors (similar to LRC).

Virtual Circuit
Bi-directional association between two DDS across a packet switched network. It is not a direct connection, but a logical communication path.

Virtual Terminal Remote
A remote operation with the ability to display an exact duplicate of the slave screen on the controller. This allows for real-time viewing and troubleshooting from a remote site.

W

WAN (Wide Area Network)
A communications network that uses public and/or private telecommunications facilities to link computing devices that are spread over a wide geographic area.

Wide Area Network (WAN)
A communications network that uses public and/or private telecommunications facilities to link computing devices that are spread over a wide geographic area.

X

X.25
Interface between DTE and DCE for terminals operating in the packet mode on Public Data Networks. This CCITT recommendation specifies that the necessary elements for an interface recommendation should be defined independently in three levels.

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